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The Geographical Journal

Vol. LXVIII No. 6 December 1926

EXPLORATIONS IN THE KARAKORAM

Ph. C. Visser

Read at the Meeting of the Society, 22 February 1926. *Folding map follows p.* 532.

TO the north of the great Karakoram range in the Hunza region there is a mountain country that belongs to the last unexplored tracts of the Indian Empire. The Hunza valley itself was well known, being an important way of communication between India and Chinese Turkestan. Sir Francis Younghusband and other travellers had made known many details about the valley which had been the scene of one of the most remarkable campaigns in frontier warfare, and which is admirably described in Knight's book about Hunza and Ladakh, entitled 'Where Three Empires Meet.' In 1911 Major Mason had joined the trigonometrical survey to that of the Russians.

Sir Aurel Stein had already traversed the principal western valley, and General Cockerill, in 1892, had visited two of the eastern side valleys, namely, the Khunjerab and the Shingshal. In this eastern region the surroundings of the Bara Khun river were still unknown, while the country at the head of the Khunjerab and the Shingshal valleys had never been mapped. Also the entire Gujerab valley was *terra incognita*.

It is therefore not surprising that this region tempted us, as it held a promise of revealing many an interesting geographical problem, besides being a part of the Earth where nature was sure to show its grandest and most impressive aspect. It was, however, not an enterprise upon which one could enter lightly. It was a well-known fact that the British Indian Government rarely gave permission to travellers to enter the country, owing to the scarcity of supplies and the great difficulty to secure transport.

Even the road to Gilgit is closed to ordinary travellers; and on the Hunza road the transport difficulties grow greater as one nears the Kilik pass, which descends into Chinese Turkestan.

We were thus most grateful to the British Indian Government, and to Lord Reading especially, for so kindly giving us permission to travel in the Hunza. Our thanks also are due to the Survey of India for the

valuable help they gave us, also enabling one of their most excellent surveyors, Afraz Gul Khan, to join our expedition.

Major Mason, of the Survey of India, most kindly helped us to work out our plans, which comprised the exploration of the following regions:

1. The unexplored tract of country to the west of the Hunza river, formed by the Pasu and Batura glaciers and their surroundings.

2. The region to the east of the Hunza river, formed by the Khunjerab, Gujerab and Shingshal valleys with their tributary streams.

3. If time permitted, the regions between the Shingshal river and the main range of the Karakoram.

We were specially anxious to make a map of the Central Asian watershed in the last two regions, where it forms the Eastern boundary, this being one of the most important geographical problems yet to be solved in this region. It is well known that the Central Asian watershed is formed by the Karakoram, that is to say, from its eastern boundary—the Trans-Himalaya also being counted as part of the Karakoram—to a point situated at about 75° 50′ E. of Greenwich, where this important function is suddenly taken over by a mountain chain curving to the north, which, unknown in its greater part, was reckoned as belonging to the Sarikol Range.

We did not propose to confine ourselves to topographical work, but also intended, if such were possible, to make collections of botanical, geological, and zoological specimens, and to make observations concerning meteorology and glacier movement. At the instigation of Prof. Magnus, of the Utrecht University, a series of physiological tests were to be made concerning the effects of great altitude on the human system, and especially the value of acclimatization. These tests were first to be made in a pneumatic chamber and also in a flying machine, and were to be repeated by the same person at the same height on the mountain.

The expedition included the following members, the work being thus divided: Ph. C. Visser (leader), meteorology and geology; Mrs. Visser, botany and the collection of butterflies; Baron van Harinxma thoe Slooten, zoology; Afraz Gul Khan, surveyor; and Franz Lochmatter and Johann Perren, guides.

The mapping was to be done chiefly with a plane-table, working from the fixed triangulation points. The map was to be on a scale of ½ inch to 1 mile.

The expedition started from Srinagar on April 25. Bad weather at the foot of the Burzil pass caused a delay of a few days, as it was impossible to use ponies for transport. The caravan consisted of ninety coolies. The remainder of the supplies were to be sent on as soon as the pass was open for the summer traffic.

On May 20 the journey was continued from Gilgit to Hunza. Major Loch, the Political Agent at Gilgit, had requested the Mir to assist us in collecting the necessary transport and supplies of flour. We found

twenty-six permanent coolies awaiting our arrival, and two jemindars, who were to accompany us as headmen of the transport column.

The first base camp was made at Pasu, and the Pasu glacier was the first to be explored. It appeared during this expedition that the condition of the snow in the higher regions was not favourable for a prolonged undertaking. It was still too early in the season, and the exploration of the Batura glacier was deferred for this reason until a later date.

On the Pasu glacier great difficulties were encountered owing to the labyrinth of seracs. After three days it was impossible to go any farther owing to the quantity of winter snow and the danger of avalanches. But in any case the journey had not been in vain, as we had penetrated far enough to see that the glacier was longer than we had thought, and as was also indicated on the Survey map of 1915. The total length was 16 miles. It was noticeable that the mountain wall on the right (southern) side of the glacier fell in unbroken precipices, while on the northern side several places looked as if they might be climbed.

On our return from the Pasu glacier we accordingly, passing the snout of the Batura, which descends right into the Hunza valley, established a second base camp at Gircha, our starting-point for the mysterious, unknown valleys at the head of the Hunza river.

The Mir had warned us that it was impossible to penetrate into these gorges excepting in the winter months, as they are completely filled by the seething water of the swollen rivers, and we had already read of the difficulties General Cockerill had experienced there even at the season when the water is at its lowest. The coolies disliked the thought of entering these valleys, and, although situated in the vicinity of the Kashgar mail route, they still had the reputation of being inaccessible, and we had not even been able to get information concerning them in the villages of Hunza.

We found that the Mir's statement was indeed accurate, only his judgment had not proved reliable in so far that at the date that we found ourselves at the entrance of the Khunjerab valley—on June 9—at the spot where the Kilik joins the Hunza river, it was still possible, although with considerable difficulty, to force a way into the gorge. However, we were fortunate indeed, as the rapidly rising water confirmed us in our fears that it would soon be too late either to effect an entrance or a retreat. It was doubtful if a feasible passage existed leading from the Khunjerab into the Gujerab valley, while the route over a possible pass into the Oprang region could not be taken into consideration as a way of exit, as we should be then completely out of reach of our base camp and the means of getting supplies.

It was indeed something of a risky undertaking to enter the Khunjerab in these circumstances. During the first marches we were continually forced to ford the river: the terrible current and the mass of seething

water at some places made it a hazardous and difficult task. General Cockerill has already given a description of the Khunjerab in his interesting account of his travels there in this *Journal*. We had the opportunity of realizing the amazing accuracy with which the topographical surveys were made, considering the simple instruments used and the difficult circumstances under which this mapping had to be done.

We found the descent of the Trip Sar (which Cockerill named the Titirrip pass) in a much better condition than on the occasion when he first arrived there, and found the terribly steep slope coated with snow and ice.

At the Bara Khun junction we decided to explore the unknown Bara Khun valley. We found it different from the other valleys we had traversed, as it showed a decided step, about 300 feet high, which is rarely encountered in this region.

The enormous slopes of scree and loose boulders on both sides made it impossible to discover any traces of former glaciation, nor whether the Bara Khun was a U-shaped or a V-shaped valley.

At intervals we found groves of trees and shrubs; higher up there was a plentiful Alpine flora.

The upper part of the valley was filled with a great glacier, which seemed to be advancing. Although the fact that we had found a step led us to expect great ice-falls, we found that on the contrary the glacier was not difficult, and that we could advance rapidly. A long climb brought us to the great watershed between Hunza and Oprang. There were two deeply cut passages in the ridge, at a short distance from each other: from the northern col a terrible precipice fell in a sheer drop to the east, but the southern gap formed an easy pass; the other side, as far as one could see, led down to a glacier which seemed to have a flat surface. This glacier divided into two branches, at a distance of about 1½ miles, and continued in opposite directions, north and south. Probably one could descend along the northern branch to the Karachukor river, and along the southern branch to the Oprang region.

The height of the pass was, according to our aneroid, about 18,000 feet. There probably is a pass between the Bara Khun valley and the Karachukor valley. One of the northern side valleys of the Bara Khun led by an easy way up to the ridge. In this valley we had seen camp fires in the evening, which showed that there were human beings. They were probably shepherds who had come across from the grazing-grounds on the other side of the range.

On our return we found our coolies in a pessimistic mood. It appeared that the water in the gorge had risen so high as to cut off our retreat to the Hunza valley by the way we had come. It had now become a necessity to find another way out of the Khunjerab.

A Shingshali who accompanied us said that he knew of a way to the

1. *Hassanabad glacier, from a point recently covered by the ice*

2. *Mountain to south of Pasu glacier, typical of mountains north of main range, Karakoram*

3. *One of the twenty crossings of the Khunjerab river*

4. *Advancing snout of Parpik glacier, Bara Khun valley*

Gujerab. On the fourth day after our arrival at the Bara Khun junction we reached the point where General Cockerill had turned to the north to reach the so-called Khunjerab pass.

We followed the valley which our coolies called the Kuksel valley, and which without doubt was the main valley, and on June 26 reached its head. Here was the source of the Khunjerab. We then turned into a left side valley which brought us on to a glacier, and reached a pass by which it was possible to get our laden coolies without too much difficulty, although the descent into a northern side valley of the Gujerab was down a terribly steep slope of scree.

We were greatly surprised to find the Gujerab a broad valley where rolling uplands covered with meagre pasture formed grazing-grounds for flocks of diminutive sheep and goats, and even some yaks. There was a small village inhabited by about thirty persons, men, women, and children, who were greatly alarmed at our appearance. They appeared to be inhabitants of a Shingshali summer settlement. This discovery relieved our anxiety, as we were now sure of being able to find a way out of the Gujerab to Shingshal. By the way the shepherds came, it was however a four days' expedition. It was in no circumstances possible, they told us, to enter the Gujerab from the Khunjerab junction, the narrow gorge being completely filled with water, with terrible precipices on either side.

We decided that Afraz Gul should follow the route of the shepherds to Shingshal, while we intended to try to find a way through the unknown territory at the head of the Gujerab valley.

During our march up the valley, which grew narrower and narrower as we advanced, we were several times exposed to the danger of falling stones, and during the night were nearly buried by a stone avalanche which just missed the site of our camp. This was the second time we had a narrow escape in the same way. The Gujerab valley was longer than we had supposed it would be, being even longer than the Khunjerab, so that in discovering the source of the Gujerab on July 3, we had also traced the Hunza river to its source.

The glacier stream issued from a big glacier, up which we climbed; at its head we found, the next day, a pass of 18,000 feet, over which we managed to bring our caravan. The descent along the slope facing south was precipitous and dangerous owing to the falling stones. At the foot of the pass we reached a glacier flowing in a southern direction, and lower down, a valley which we surmised would be a side valley of the Shingshal. Here we found another little colony of shepherds.

Here once more the water barred our way and we were forced into a side valley running to the west. We crossed another pass of 17,000 feet and descended into the Zardigarbin valley, where we found Afraz Gul, who had just arrived from Gujerab by the ordinary route. The Zardigarbin is one of the most beautiful valleys we encountered in this region.

3. One of the twenty crossings of the Khunjerab river

4. Advancing snout of Parpik glacier, Bara Khun valley

A last difficulty awaited us just before reaching the village of Shingshal. The rope bridge had been destroyed by high water, and it took a whole day's hard work to make a new one and to get our entire caravan safely across the swollen river.

In the Shingshal valley we once more trod the tracks of General Cockerill, who had done the first pioneer's work there; during his expedition up the valley he had, however, turned up a northern side valley in order to reach the so-called Shingshal pass, which leads to the Oprang.

We first intended to try to discover the source of the Shingshal. Two marches beyond Shingshal we made the exciting discovery of an immense glacier region which was quite unknown. Although there was every reason to suppose that there would be an extensive tract of snow and ice at the head of the Shingshal valley, this immense glacier complex, the greatest in Central Asia, was beyond our expectations, for, as we argued, the southern and south-western monsoon must have already deposited its burden of snow on the snowfields of the Himalaya and Laskar range, and on the southern slopes of the Karakoram.

On the first march beyond Shingshal we crossed a great glacier which the natives called the Yazghil, flowing from the south and reaching right across the Shingshal valley. The head of the valley was entirely filled by another great glacier, the Khurdopin.

The snout of this glacier was at a height of about 11,000 feet. The upper end descended from a step, so that for many miles it had the aspect of a wild sea of ice. The masses of broken ice with its terrible labyrinth of seracs and crevasses made it impossible to advance, but by ascending a high point we were able to gain a view of the glacier up to its head. Its entire length was not less than 32 miles.

Very typical of the Khurdopin was the series of beautiful little glacier lakes, which, although extremely picturesque, are a source of great danger. We were also struck by the curious little valleys between the glacier and the mountain side, to which I have given the name of moraine valleys. We had already noticed them in the Sasir group in 1922. As these little valleys form deep and narrow gorges along the outer curve of the glacier, they might be considered as "Randklufte," occurring generally on the northern side of the glacier, thus against the mountain side facing south, and the supposition is not too far-fetched that these moraine valleys are produced by the great heat given out by the mountain wall, which prevents the ice from touching it. It is needless to say that at this latitude the circumstances which are brought about by the intense heat of the sun are particularly conducive to the formation of these moraine valleys. The vegetation is generally abundant, and these little oases in the midst of a landscape of death, composed of barren rocks and snow and ice, come as a pleasant surprise. Sometimes a little stream flows through the tiny valley for a distance of several miles, another typical proof of the compactness of the ice, showing that the water can nowhere find an

5. *Sarikol Watershed, head of Parpik glacier*

6. *Gujerab valley*

7. Southern side of col between Gujerab and Shingshal valleys

8. Shingshal village

outlet under the glacier. The width of these valleys varied between 30 to 40 feet and 1½ miles.

Although until recently I had always believed that this formation was confined to tropical and sub-tropical mountain regions, this supposition seems to be denied by an observation in an article by H. F. Lambart (*The National Geographical Magazine*, vol. 49, No. 6, June 1926), in which he describes the ascent of Mount Logan, and which is contained in the following sentence: ". . . They discovered that between the wall of the glacier and the land there was a deep canyon, through which flowed a turbulent icy stream. . . ." It appears that there also a kind of moraine valley had been formed.

Another phenomenon that struck me on the Khurdopin glacier, and that I noticed later on other glaciers (I had already observed it in the northern side valley of the Shingshal through which we had come over the Mai Dur pass from the Gujerab) was that all these ice-flows showed a tendency in their upper part to take an easterly direction and to curve afterwards with a sharp bend to the west.

During our expedition up the Khurdopin glacier we passed under an immense mountain peak—its height proved to be 25,460 feet—which we afterwards identified as being the Kanjut Peak, which had been already fixed on the map from the southern side. The Workmans, however, must have failed to place it accurately during their visit to the Hispar region.

The mountains on the northern side of the Karakoram are of terrific steepness and the scenery of indescribable grandeur.

Returning to the snout we continued our exploration up the broad northern valley to which the natives give the name of Virjerab. This again was filled by another enormous glacier. It was 26 miles long and entirely covered with dirt and loose stones and boulders of colossal dimensions. The region it drained seemed to be relatively small, considering that the lower part of the ice-stream descended to 11,000 feet, and that its head was situated close to that of the Khurdopin glacier, being surrounded however by extremely high peaks.

On our return to Simla, aided by Major Mason, we subjected the results of these observations to a detailed examination, so as to be able to find the connection with the regions on the southern side of the main range of the Karakoram, which had been mapped by Sir Martin Conway and the Workmans during their expeditions there in 1892 and 1910. This did not cost us much trouble, and without having to make any important alterations we found that both the Khurdopin and the Virjerab glaciers are situated in the immediate vicinity of the great "Snow Lake," discovered by Sir Martin Conway, where the Hispar and Biafo glaciers rise. The next question naturally is, whether the Khurdopin and Virjerab glaciers do not also flow from this gigantic snow basin?

At the spot where the Virjerab joins the Khurdopin valley we found a

glacier lake which reaches up to the side wall of the Khurdopin glacier and has found an outlet under the last-named glacier to the Shingshal river. It is clear that the existence of this lake must be a continual danger, causing inundations in the Shingshal and Hunza valleys. At any time it may occur that the pressure of the glacier prevents the water from flowing under the ice; the lake then rises to a great height. When however the obstacle is suddenly removed it discharges itself with tremendous speed, and a catastrophe arises. We could clearly observe that the height of the water varied considerably, as the horizontal lines on the mountain side showed that at one time it had reached an elevation of more than 300 feet above its actual surface.

This lake might be compared, although on a larger scale, to the well-known Märjelen See in Switzerland. The inhabitants of Shingshal appeared to be aware of the danger which thus threatens them, and the flood which years ago almost completely destroyed the entire village, nearly certainly found its origin in this glacier lake, which however is not the only source of danger, as the small lakes farther up the Khurdopin glacier also drain into the lower and bigger one.

Before returning to Shingshal we explored the Yazghil glacier, the third great ice-flow of this region. We managed to reach the upper part, but unfortunately bad weather prevented us from gaining a clear view. The length of this longitudinal glacier may be reckoned to be about 23 miles.

It is unnecessary to point to the fact that the question of food supplies for a comparatively big caravan in these uninhabited desert regions of the high mountains, where all progress is extremely difficult and dangerous, is a problem which causes considerable anxiety. Nevertheless we had been able to extend the expedition to the head of the Shingshal, originally intended to last not more than a week, to an eighteen days' sojourn in the most tremendous ice wilderness we had ever encountered, traversing in the meanwhile a distance of more than 100 miles. Our coolies deserved our admiration for the pluck and endurance they had displayed. The falling stones and mud avalanches had been a continual danger.

Our next expedition was to the Malangutti glacier, formerly mentioned by General Cockerill. It is of special interest, as at its head rises the highest peak of the western Karakoram. This magnificent summit was found by Major Mason to be 25,668 feet high, when he saw it from the surroundings of the Hunza valley. General Cockerill called it Malungi Dias, but probably the glacier only is called Malangutti Yaz, which means Malangutti glacier. The natives call the mountain Dasto Ghil, a word which is used for the enclosure of stones in which the sheep are driven at night, the shape of the mountain recalling this structure.

We penetrated three marches up the glacier in the immediate vicinity of the great peak, but owing to bad weather were forced to return to the

9. *Zardigarbin valley, northern tributary to Shingshal valley*

10. *Kanjut Peak* (25,460) *above Khurdopin glacier*

11. *Khurdopin glacier* 18 *miles from snout*

12. *Southern tributary of Khurdopin glacier, and Karakoram range*

Shingshal valley. However we had had the opportunity to observe our surroundings closely, and we once more came to the conclusion that the northern slopes of the Karakoram rise out of the deeply cut valleys and glacier troughs with such terrible precipices that an ascent from this side is a sheer impossibility.

Another result of our investigations was to show that the supposition —such as was also indicated on the Survey maps—that the Malangutti glacier found its origin on the southern side of the Dasto Ghil, was not correct.

There is no doubt that the glacier rises on the northern side of the last-named mountain. But having stated this fact, another problem presented itself. If the glacier did not come from the southern side of the Dasto Ghil, what then lay behind this great peak? According to the map of Sir Martin Conway and the Workmans the main range of the Karakoram was situated farther to the south, and between this and the Dasto Ghil in that case there must exist a snow basin. But where did it drain, if it proved to be thus? This question occupied our thoughts without our being able to find an answer to it.

When, a few days later, we passed the Momhil glacier, on our way down the Shingshal valley, we observed that it could not drain on to this side, so that the only outlet could be either to the east along the Yazghil glacier, or to the south by the Hispar glacier, which however did not conform to the indications of Sir Martin Conway and the Workmans.

As it was impossible to gain a view of the unknown snow basin from the northern side, the only way of solving the problem would be from the southern or Hispar side, and we determined, if we had time enough left, having finished our work on the Batura, and if the approaching winter did not bar all exploration in the high snow regions, to try to solve the problem on our return to Hunza and Nagar.

At this season the gorge at the entrance of the Shingshal valley is completely filled by the swollen river, so that we were forced to return to the Hunza valley by the so-called summer route over the Karun Pir pass, which has already been described by General Cockerill. This route is greatly dreaded by the coolies. It involves a climb of 7000 feet, from the Shingshal valley, up steep slopes of barren rocks and scree, without encountering a single spot of shade nor, worse still, a drop of water.

After many weeks in the pathless wastes of the Hunza gorges and glaciers, the Kashgar mail route appeared a veritable high-road and Pasu a luxurious retreat. The base camp here was our starting-point for the Batura expedition. Only about 3 or 4 miles above the snout were known, and the Mir and the inhabitants of the neighbouring villages had assured us that it was impossible to go any farther.

However, we managed to penetrate into the very heart of this unknown

11. *Khurdopin glacier 18 miles from snout*

12. *Southern tributary of Khurdopin glacier, and Karakoram range*

mountain region and to explore the glacier up to its head, including its tributary ice-flows, so that this part of the expedition included some of the most interesting discoveries we made, besides revealing to us the most glorious and wonderful mountain scenery that can be imagined. We found that the glacier had a length of 37 miles, thus is among the greatest glaciers on Earth, outside the polar regions.

It is not possible here, owing to lack of space, to give a detailed description of this most interesting region. It was specially noticeable that as regards the southern boundary of the glacier individual peaks really did not exist, but that a mighty mountain chain like a great wall continued for about 25 or 30 miles, with an occasional summit on this ridge rising to a height of more than 25,000 feet. As in other parts of the northern side of the Karakoram, the great ice-clad cliffs drop in terrible precipices down to the glacier.

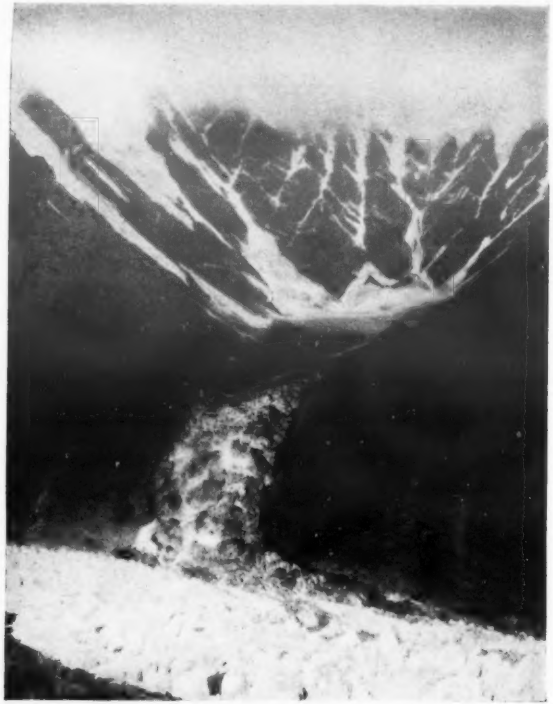
The Survey of India places the Batura in the Hindu Kush, but it is more accurate to consider this southern boundary, geographically as well as geologically, as belonging to the continuation of the Karakoram, through which the Hunza river has forced a way. It is as yet impossible to know exactly how far the Hindu Kush advances to the northern boundary of the glacier, but it is certain that we must look for the region that feeds the Batura principally on the southern boundary, that is on the side of the Karakoram, so that I would venture to propose reckoning this glacier as belonging, not to the Hindu Kush, but to the Karakoram.

Another characteristic feature of the Batura is that the glacier is extraordinarily flat, even more so than the Khurdopin. Over a distance of more than 20 miles it hardly falls more than 2000 feet; this accounts for the remarkable fact that about 20 miles above the snout we found the water on the glacier flowing for a considerable distance in the wrong direction, as one might express it—flowing uphill!

The moraine valleys were of a great dimension; in one place, about 12 or 13 miles up the glacier, we found one of these valleys about 1500 to 1600 feet wide, with trees growing in the desert soil, while higher up there was abundant vegetation. A broad and turbulent stream flowed for several miles through this valley.

We much regretted that we were not able to examine the movement of the glacier, for without doubt the progress was exceedingly slow. Speaking about this question with a well-known glaciologist, he observed that here probably was a case of so-called "dead ice," that only now and then is pushed towards the valley by an accumulation of fresh masses of snow.

If such should prove to be the case one can only be more impressed than ever by the enormous volume of these masses of ice, that withstand the burning heat of the summer in the valleys to such a degree that the ice descends right into the Hunza gorge, which is as low as 8000 feet, blocking the entire valley.



13. *Yazghil glacier and tributary*

14. *Stone avalanche in the Virjerab valley*

15. *Kunyang glacier (Workmans' Lak glacier). Dasto Ghil on right*

16. *Rosebush in moraine valley beside the Malangutti glacier*

Once more the question arises: What is the reason that we find these enormous glaciers on the northern side of the Karakoram? The solution of the problem must be purely meteorological. The winds bringing the moisture must be the south and south-western monsoon. Everywhere in the regions of the Karakoram which we visited the cornices hang over to the northern side. However, the greater part already having been deposited on the slopes of the Himalayan and Laskar ranges, other reasons must prevail, and probably the average lower temperature of these northern regions has something to do with it. The deposit of moisture is less, but also less of the snow and ice melts than in the regions to the south. Snow and ice avalanches were very frequent here.

An effort to reach the summit of the ridge at the head of the Batura had to be abandoned owing to the impossibility of climbing the perpendicular wall of rock; the intense cold forced us to retreat 150 feet below the top at a height of 20,000 feet.

During an exploration of the great northern branch, starting from the so-called "Junction," we reached a pass which eventually would lead into the Chapursan valley; the descent however was too difficult for our caravan of heavily laden coolies, and the bad weather forced us once more to turn back.

The whole Batura expedition, during which we traversed about 120 miles, took us twenty days. On September 13 we once more reached Pasu.

Although the winter season was approaching rapidly in the high mountain regions, we determined to try to solve the problem of the Dasto Ghil from the Hispar side before returning to Gilgit.

In Nagar we made all our arrangements, abandoning our Hunza men, and taking on Nagar coolies, with which the Mir provided us. We started on September 20, and four days later reached the side glacier on the right bank of the Hispar which is indicated on the map of the Workmans as the Lak glacier. The name however is not accurate: the natives call the mountain and the grazing-grounds Lak, but give the glacier the name of the Kunyang glacier. We found that the map of the Workmans was correct as far as could be seen from below. Unfortunately, to our great disappointment a snowstorm which lasted three days prevented us from penetrating further up the Kunyang glacier beyond the first two marches. As soon as the weather cleared up we however managed to climb a small peak, from which we obtained a good view of our surroundings. This led us to the conviction that the unknown basin drained along the Kunyang glacier. What the Workmans and we also, as long as we had only seen it from below, had believed to be a low pass, proved to be in reality nothing but a platform down which the glacier suddenly fell. This discovery changed the position of the Karakoram watershed and enabled us to place the Dasto Ghil on the watershed itself.

The Dasto Ghil was visible from the small peak we had ascended, but not from the glacier. If I have seen correctly, there were two middle moraines on the part of the glacier that issued from the basin, thus proving that it contained three small glaciers.

On October 1 we commenced our return journey. Fresh winter snow covered the summit of the Burzil, and the Tragbal pass looked like a Polar landscape when we passed it four weeks later. On October 30 we reached Srinagar, having travelled more than 1200 miles; 2580 square miles had been mapped, the greater part being *terra incognita*.

The various collections have been placed in the hands of specialists, who have undertaken to determine them. The results will be published later on.

According to the practice of the Royal Geographical Society and the Survey of India, the names indicated on the map are those used by the inhabitants, and the local names are the only ones which have been given. For important unnamed peaks, passes, etc., we propose that such names should be given as can be derived from existing names of neighbouring valleys, glaciers, grazing-grounds, etc.

The name Karakoram was known to the Mir of Hunza, but he only thus indicated the mountain range to the east of the Hunza river. The range to the south of Pasu and the Batura glacier was called by him Mustagh, which, meaning "white mountain," is a more appropriate appellation than Karakoram, or "black gravel."

Before the paper the PRESIDENT (Dr. D. G. HOGARTH) said: We now proceed to the main business of the evening, the interesting and exciting experience of hearing an account from Mr. Visser of the remarkable expedition from which he and Mrs. Visser have just returned. At the same time, we assist at the obsequies of another little bit of the unknown world. This most obscure corner of the Himalayas is apparently one which demands the greatest courage and endurance from its explorers. The Vissers know only too well what travel in that country means, and the extreme danger not only of being shut up by the snow in the passes, but also of the continual rain of falling stone. Those who have been members of the Society for some time past will remember the very interesting account of the region which was given in 1922 by General Cockerill. Since it was in that same year that Mr. Visser published his first book upon the Himalayas, you will understand that this recent expedition was not the first experience which Mr. and Mrs. Visser have had of these mountains. Mr. Visser comes before you as an old and tried Himalayan explorer, and as now having accomplished what has for long defied and defeated the ambitions of many explorers of that great range. I gather that he intends to go back into the Himalayas, but he will not find anything when he returns quite so unknown, quite so remarkable, quite so stupendous as that which he is going to describe to-night. I therefore have every pleasure in introducing Mr. and Mrs. Visser and, in the name of yourselves—that is to say of the Society—I beg Mrs. Visser to accept these flowers from us, and these, which are the gift of General and Mrs. Cockerill, as a delicate tribute

17. *Moraine valley beside the Batura glacier twelve miles from snout*

18. *Descending the Batura glacier*

19. *Mountain wall of Batura glacier rising to 25,540 feet*

20. *Snow avalanche, Batura glacier*

to those who have succeeded him in the same region. It had to wait thirty years! I now call upon Mr. Visser to address the Society.

Mr. Visser then read the paper printed above, and a discussion followed.

Brig.-General G. K. COCKERILL: I imagine that every one of you in this hall has, as I have, greatly enjoyed this trip through the Karakoram with the intrepid explorers who are with us to-night. I do not suppose, however, that I can succeed in conveying to them my pleasure and gratitude on being taken back thirty years and seeing, upon this screen, mountains and valleys the memories of which are so deeply impressed upon my mind. In the days when I travelled through this region of the Karakoram Himalaya I had still in front of me the task of reconnoitring the northern frontiers of Hunza and Chitral. I was not able to carry out an exploration on the scale described to us to-night, but had to rest content with a hurried traverse of the main valleys. This region, then, when Mr. and Mrs. Visser entered it, comprised a great extent of country in which no white man had ever set foot. Sir Francis Younghusband, coming from the east, had looked into it at one point from the top of the Khunjerab pass and at another, crossing the Shingshal pass, had penetrated a few miles west of the Mustagh or Northern Karakoram range, into the valley of the Tang river, a tributary of the Shingshal river. I came from the west through the gorges of the Shingshal and Tang rivers to the same point near the Shingshal pass, where I linked up with the work done by Sir Francis Younghusband. Returning down the valley, I had a wonderful view south-east towards its head near the Hispar pass. I then crossed by the Karun Pir pass to the Hunza valley and pushed on towards the Khunjerab pass. It was November, and a heavy fall of snow forced me to turn back. The following spring, however, I reached the Khunjerab pass, and from near the Titirrip pass had a good view up the Gujerab valley. I formed the opinion that at its head was the main source of the Hunza river.

The region, then, between the Khunjerab and Shingshal valleys was, when Mr. and Mrs. Visser began their work, entirely unmapped, the head of the Gujerab valley unseen, and the actual alignment of the Northern Karakoram range between the two passes unknown. By the time they entered the Shingshal valley from the north they had discovered a new pass at the head of the Bara Khun valley and thoroughly explored the Khunjerab and Gujerab valleys. They had traced the source of the Hunza river to a glacier at the head of the latter valley, and they had left nothing behind them unmapped. They then turned their attention to the glacial region lying in the angle between the Mustagh (or Northern Karakoram) and Karakoram ranges. Here they were treading wholly virgin soil. The three vast glaciers—Yazghil, Khurdopin, and Virjerab—had never been explored and no white man had even seen the Virjerab. There was, moreover, great mystery prevailing in regard to the trend of the glaciers around the great peak which I had discovered and the position of which I had fixed on my visit to the Shingshal valley, and which was subsequently ascertained by the triangulators of the Indo-Russian Link to be 25,868 feet in height. Its name, I was told, is Malungutti, but Major Mason heard it called Dumata, and Mr. Visser was given Dasto Ghil as its name. The mapwork north of the Hispar glacier was doubtful. The authorities differed considerably regarding the proper position both of Hispar village and of the lateral valleys. I suspected that the surveyors of the Bullock-Workman expedition had placed them considerably to the west of their true position. I had seen photographs taken by them

19. *Mountain wall of Batura glacier rising to 25,540 feet*

near the head of the Lak glacier, and I had seemed to see, in the shape of mountain masses at its head, a very strong resemblance to the Malungutti peak.* Mr. and Mrs. Visser's expedition has now lifted the veil and shown clearly that the Lak glacier turns eastward at its head, and does in fact spring from the south-western slopes of this mountain. Malungutti is therefore as I suspected, on the main Hispar–Shingshal watershed, and is apparently the highest point on the Karakoram range west of K_2.

To sum up the results of the expedition, of which, in my opinion, Mr. Visser has spoken with undue modesty, the Bara Khun, Gujerab, and Shingshal valleys have been completely mapped, the sources of the Hunza river discovered, and two vast glacier systems—the Batura and the Khurdopin—explored. In addition, he has given us for the first time the true alignment both of the Mustagh and Karakoram ranges north of the great Hispar trough. These results, I need not say, are of the highest geographical value. Mrs. Visser also, by her collection of butterflies and of plants, has added greatly to our knowledge.

Having seen the Hindu Kush region from Kafiristan to the Shingshal, read all that Sir Aurel Stein and others have written of it, and discussed it with Sir Martin Conway, Sir Francis Younghusband, and many others who have seen it, I have had some opportunity of estimating the comparative difficulties of the various valleys. I feel sure all will agree with me that nowhere in the world is there a country at once so forbidding and so alluring as is Hunza. It is not merely the stupendous nature of its mountains and gorges—of which we have seen something to-night in the magnificent photographs shown to us—but also the dangers and difficulties that have to be surmounted at every turn, which bear witness to the courage, resolution, perseverance, and enterprise of the two explorers to whose achievement I am so proud to pay this small and inadequate tribute.

Sir MARTIN CONWAY: I need not say that I have listened to this paper with extraordinary interest, because it brings back to me the memories of thirty odd years ago in a most vivid manner. You may have noticed across the bottom of the map slide the end of the long Hispar glacier, which would have extended further to the right along the bottom of that map. That was the valley up which I commenced my work in those parts. You know how it is with a little boy who grows up in a back yard surrounded by walls, and who wants to see what is on the other side, but never can? That was my position. I was going up a trough between enormous ranges of mountains, wondering all the time what was on the other side. At the same time General Cockerill was going up the Shingshal valley, and we neither knew anything of what the other was doing, and we of course could not see each other's territory. Naturally, when going up a deep trough, or any of the valley troughs, one does not see very much of the ranges of mountains shutting one in on either hand, because there are side valleys going up to them, and the knees of the mountains, if you compare them to seated figures, get in the way and hide the peaks from those who are walking along at their feet. The result was that any kind of sketch-map which I was able to make of that journey did not show, and could not show, the arrangement of side glaciers and so forth back against the central range. For instance, that great mountain which General Cockerill first discovered was never visible from the Hispar glacier.

Mr. Visser has spoken a great deal about avalanches, falling stones, floods,

* *The Geographical Journal*, vol. 60, No. 2, p. 111.

and all the rest. That part of the world is filled with mountains in what I may call a dramatic stage of their existence; they are relatively new mountains, and therefore they are so big and so rotten; they tumble to pieces and they crash about all the time, slowly being denuded down to what may ultimately, in a million years, be a reasonable rounded shape, like the Alps, and thus climbable. At present most of the mountains in that region are utterly unclimbable, being, as I say, in a crude and unfinished condition. Mr. Visser referred to snow avalanches; he showed you a magnificent photograph of one falling, and, at the same time, spoke of the frequency with which they fall. I can confirm that in every respect. When I was in that part of the world great snow avalanches were booming down the mountain side, to right and left, all the time. In the Alps, when there is an avalanche from Monte Rosa or Mont Blanc it is, generally speaking, the sort of thing that happens once a month, except in spring, of course. On the other hand, I remember one particular spot in the Karakoram when no less than eighteen enormous avalanches came down within half an hour, following one another almost like minute-guns; tremendous falls of ice and snow in each case. Falling rocks, too, are buzzing and humming all the time. Those are the concomitants of travel in those parts, and so is the crossing of rivers. I remember one river crossing which took us four hours. We had to carry not only the dogs but our sheep, our baggage, and everything else. After stretching the rope across and getting the last load over at the end of four hours, something happened and the river ran dry! That is one of the pleasures of exploration in that district.

H.E. the NETHERLANDS MINISTER, in proposing a vote of thanks to Mr. and Mrs. Visser, said: I assure you that I have ascended this platform with a heavier conscience than any high mountain-top has been climbed by the distinguished lecturer of to-night, because during dinner Dr. Hogarth agreed with me that there would be no need for me to speak to you, but at the same time he said, "I am sure, Mr. Minister, that you will be so impressed by the charm of the lecturer that you will not be able to resist." Dr. Hogarth has once more proved that he is the most far-seeing President any society can have. I congratulate him. And after all it would be a crime if I, having the honour of representing the country from which these two distinguished travellers come, kept myself quite silent to-night.

I have to greet you, my dear Mr. Visser, as perhaps many of the audience do not know, in a double capacity: in the capacity first as a member, an honorary member, of our Netherlands Diplomatic Corps, attached to our Legation in Stockholm. In the second place, of course, as one of our most distinguished explorers, whom we have known for many years. In both those capacities I can give you unlimited praise. As a diplomat you have shown to-night that you can live up to what is one of the traditions of our caste. A well-known British statesman in the time of James I. once said: "A diplomat is a man who is sent abroad to lie for the benefit of his country." Absurd as those words may seem to you at this moment, I want to add just a little detail. I had this morning the privilege of a visit from Mr. Visser, and when he spoke of the pleasure which he had in reserve for us to-night, he said to me in the most serious way, "You know, I am not only handicapped, but I am in an awful position, as I never have succeeded to master sufficiently the English language." Ladies and gentlemen, I ask you whether that was true.

As for the explorer, certainly no profane words of mine, after what we have heard from the experts who have spoken, would add anything to the praise and the admiration which have been expressed. I have asked myself, how is

it possible that a Dutchman, a man coming from the Low Countries, found the inspiration to climb so high? I did not find the answer until this morning, when I read in one of the Dutch papers that Mr. Visser is a native of the city of Schiedam. That accounted for the spirit in which he had climbed to the highest mountain-top of the Karakoram.

Mr. Visser, I congratulate you and thank you most sincerely in the name of our country, whose praise you have already received, that you have been able to again add to the glory of the whole country. I am sure that none of those present would be satisfied if I limited this praise only to the male member of the partnership.

I have the greatest pleasure in proposing a vote of thanks to the distinguished lecturer of to-night and to his wife, who, as scions of the lowest country in the world, have proved themselves to be pioneers of civilization in the highest regions of the globe.

Sir FRANCIS YOUNGHUSBAND: It is with the greatest pleasure that I second the vote which has been proposed so very eloquently by His Excellency the Netherlands Minister, and I should like to support not only all that he has said but what has been said by General Cockerill, who knows more than anybody else what the difficulties must have been which Mr. and Mrs. Visser have so successfully overcome. I also support what Sir Martin Conway said, because he too has explored in that neighbourhood and knows what the difficulties are.

I merely looked into the Shingshal valley in the year 1889, but the difficulties that I saw ahead of me afforded me an excuse for going round and exploring some other parts—the Khunjerab and the Mintaka passes, and eventually coming down into the Hunza valley through the Mintaka Pass. To-night we can visualize to ourselves the tremendous mountains. I have hitherto before the Society belittled photographs because they seem to me to bring down the mountains and make them seem lower than they really are. Nevertheless, those that we have seen to-night do give an idea of the rugged grandeur and stupendous height of the magnificent gorges in that region. I suppose in the whole of the Himalaya there are no finer gorges than there are in Hunza, and Mr. Visser's photographs are some of the best ever taken in the Himalaya.

There was one photograph which especially interested me, that of an immense lake which had been formed and which Mr. Visser thought about forty years ago had swept away the Shingshal village. As a matter of fact, I think it was thirty-three years ago. I was then in Gilgit, and I remember we had news of an obstruction in the Shingshal valley and of a lake being formed and getting higher and higher. We knew that there would come a time when that lake would get so high that it would burst through, and that there would be frightful floods all the way down the valley. The lake was watched and warning given. Disaster was thus prevented. But that was an instance of the way in which these mountains tumble down, or glaciers advance and make a great blockage in the steep valleys, so that the time comes when the water bursts through and immense floods occur even as far down as the plains of India. It was of special interest to see, thirty-three years afterwards, a photograph of the actual place where the lake had been made.

There is one observation which I should like to make in conclusion, and it is this: I remember (when General Cockerill gave us a most vivid account of his journey in the Shingshal valley) observing that it was surprising that the officers of the Gilgit garrison close by did not themselves go and do what Mr. and Mrs. Visser have done this summer. A few months ago I met an officer

from Gilgit who said he had read General Cockerill's lecture and my observations thereon and had asked leave to make an exploration of the Shingshal valley, but for some reason or other had been refused leave by the authorities. The only conclusion one can draw from that is that the officers up there are kept so hard at the grindstone of their military duties that they are unable to get away from it. But it is a great pity, seeing that there is this extraordinary region so close at hand, that they should not be able to explore it. It is all the more creditable to the citizens of a country so very distant from the Himalayas that they should have had the enterprise to go all the way to India and explore a country so different to their own. So I most heartily second the vote of thanks which has been proposed by His Excellency the Netherlands Minister, and I should like to add my tribute to those which have already been paid to Mr. and Mrs. Visser. It was a magnificent expedition. We congratulate them not only upon their determination and resolution in carrying it through, but also upon those beautiful photographs and, no doubt, the magnificent botanical collections which they have made. I congratulate you, Mr. Visser, and thank you very much indeed for having given us a lecture in such vivid English on your valuable explorations.

Dr. T. G. LONGSTAFF: I should like to congratulate Mr. and Mrs. Visser on the successful accomplishment of a very valuable piece of work, and to assure this audience that Mr. Visser has underrated the dangers of avalanches in that country as well as the danger of crossing its rivers. If diplomacy is what we have been told it is to-night, then Mr. Visser is a true diplomatist, for he has very skilfully concealed the truth from us: the difficulties he has overcome are much greater than he has allowed himself to tell us.

The PRESIDENT: We have had a remarkable experience which has, I think, expanded our horizon. I should very much like to know some of the secrets of Mr. Visser's photography and, among other things, who is his lens-maker. I have certainly never seen photographs, as Sir Francis Younghusband said, which preserved the height of the mountains as did the photographs we have seen. I am sure you have all listened to Mr. Visser not only with immense interest but with very great admiration for the qualities which have gone to make a success of the expedition; admiration which, perhaps, is only equalled by the sympathy which you must have felt for the coolies! In your name I put the vote of thanks, which has already been moved by His Excellency the Netherlands Minister and seconded by Sir Francis Younghusband, to Mr. and Mrs. Visser.

The vote of thanks having been carried with applause,

Mr. VISSER said: I have only to record my thanks to General Cockerill, Sir Martin Conway, the Minister of the Netherlands, Sir Francis Younghusband, Dr. Longstaff and the President for the very kind words they have used. May I add a few words in reply to Sir Martin Conway? I believe that the glaciers he discovered on the upper end of the Shingshal valley found their source in the snow-lake he discovered thirty years ago, because they go to the snow range. I cannot think it would be possible to find in that region such a tremendous glacial complex if it did not come from that snow range. And a few words with regard to the movement of the glaciers. On every glacier that we found in Hunza and other regions we took observations, and the strange thing was that one glacier would go back and the other go on. I hope to say something more on that subject in the *Journal* of the Royal Geographical Society. Thank you very much.

THE BRITISH ISLES IN THE NAUTICAL CHARTS OF THE XIVTH AND XVTH CENTURIES

Michael C. Andrews, M.R.I.A.

With nine figures on folding sheet at end. The numbers in brackets refer to the list on p. 480.

ONE of the most remarkable features of the early nautical charts is the comparative accuracy in their representation of the Mediterranean basin. In sharp contrast with the confused, inaccurate, often symbolical, and always theoretical delineation in contemporary Mediæval Mappæ Mundi, the work of the marine cartographers, although strictly limited in scope, stands out conspicuously as the earliest attempt to produce a map of practical utility. Although in the period we are about to examine, their excellence was little appreciated by learned geographers, who continued to rely upon ancient models, maps of the marine type began to find their way, as supplements, into the Ptolemaic Atlases. With the change of outlook that is characteristic of the sixteenth-century renaissance of geography they were increasingly used to expand the restricted area and correct the established errors of ancient cartography; and they constitute one of the elements of our modern maps.

The lack of examples before the end of the thirteenth century makes it difficult to form any clear idea as to the origin and development of the nautical chart of the Mediterranean. Bearing in mind the want of suitable instruments and the elementary methods of hydrographical survey practised at this early period, it is difficult to believe that a map of such correct general form and relative proportions, with so many coastal details and such a wealth of place-names, could have been developed in rather less than half a century. But other considerations may perhaps lead us to accept, as a provisional hypothesis, the view which supposes that the prototype of the portolan charts was put together from partial coastal sketches in the last half of the thirteenth century. It is certain that the work was completed by the end of that century; for the model then in use was copied with but little alteration, except in detail, for the next three hundred years.

But if the source and growth of the Mediterranean chart are still subjects for speculation and discussion, the materials at our disposal happily permit of a greater certainty for the regions outside the Straits of Gibraltar.

In the thirteenth century a considerable maritime commerce was carried on by the traders of Western Europe, but if they used charts none have come down to us; and while the overland route to Flanders and the Low Countries was the recognized mercantile channel of the Italian cities, their map-makers had little incentive to delineate these coasts. That they formed no part of the original, or, as Nordenskiöld terms it, the "Normal," portolan chart, may be inferred from an examina-

tion of the maps themselves. Drawn on a scale which differs from that employed for the Mediterranean, the poor form of the Atlantic coasts in our earliest examples indicate that they had not long been laid down.

As the British Isles were not introduced until a still later date, we may trace their representation from the earliest partial and inaccurate form, through several stages of expansion and improvement, to a complete map. And we shall find that this map never approached either to the accuracy or to the fullness of detail that characterizes the chart of the Mediterranean; nor did it attain a like degree of standardization, but suffered continual alteration and revision at the hands of many cartographers of various nations. In the three centuries during which the portolan charts flourished, no less than fourteen distinct typical forms of the British Isles may be distinguished. A comparative study of over one hundred charts dating from the fourteenth and fifteenth centuries shows that with few exceptions these conform closely to four main types: (1) the early Genoese; (2) the Venetian; (3) the Catalan; and (4) a later group of uncertain origin. It is therefore possible to present a fairly comprehensive and, I trust, not inaccurate view of the work of this period by means of a limited number of typical examples. Any consideration of the few but interesting charts containing individual and unclassifiable characteristics must be omitted from this brief sketch.

The earliest known chart—the so-called "Carte Pisane" of the late thirteenth century—shows only the south coast of England. Lying outside the loxodromic network, this outline illustrates by its crude form, scarcity of place-names, and by the extraordinarily erroneous position assigned to the Thames estuary, how little of English geography was then known to the marine cartographers of Italy.

It is to the craftsmen of Genoa, famed alike for her military and mercantile marine, that we owe the first nautical map of the British Isles which shows any detailed knowledge of these kingdoms. From what source did the Genoese obtain their information? M. Charles de la Roncière, believing that mediæval hydrography was based upon data obtained from military operations of a naval character, suggests that it was from Benedetto Zaccaria (1). In his office of grand admiral to the Byzantine fleet, this illustrious Genoese captain certainly had every opportunity of appreciating the value of such charts as were then in use in the Eastern Mediterranean; while the naval operations against England conducted by him for the King of France in 1298 were undoubtedly favourable for the collection of coastal information. But we have no positive knowledge that Zaccaria caused this information to be recorded in the form of a chart; and in any case it was not until Genoese merchants were already engaged in commercial ventures by the sea route that we find any detailed knowledge of England.

The map of 1311 by Petrus Vesconte, which is the earliest dated marine chart now known, includes only the Black Sea and the Eastern

Mediterranean. In 1313 Great Britain appears for the first time. Two other charts by the same hand, both dated 1318, contain the same map, while in 1320 a very defective representation of Ireland, with no place-names, is added. In a little-known atlas of the following year by Perrinus Vesconte, Ireland, with its great western bay of the "happy and fortunate islands," assumes the characteristic form which, with some variation but with no radical alteration, was employed by the portolan chart makers of all schools for the next century and a half; and which, notwithstanding the introduction of many new types, continued to be copied throughout the sixteenth century. The full series of place-names on this map from Achill Island in the west to Portrush and the river Bann in the north-east, indicates that Irish seaports and harbours were well known at this period to the navigators of the Mediterranean (Fig. 1).

All these examples agree in the delineation of England. The whole of the south coast so far as the Thames estuary is depicted in some detail and with comparative accuracy; but the projection of East Anglia is barely indicated, north of which the Wash is the only recognizable feature. Of the west coast it is apparent that little was known; even the Bristol Channel is omitted, and north of St. David's Head the coastline is carried in one great unbroken concave sweep to the Mull of Galloway. Scotland is left unfinished in the north; the coastlines so far as the Firths of Clyde and Forth are only roughly indicated, and no place-names are recorded.

But in his chart of 1327, Perrinus Vesconte corrected some of these faults (Fig. 2). Although Cornwall and Devonshire are too much reduced in size, the Bristol Channel with Carmarthen Bay is a prominent feature. The western projection of Wales is indicated, but it is carried too far north and terminates in the great gulf of the Solway Firth. The position of points on the east coast relatively to those on the west remains erroneous; the Wash is on the same latitude as the Solway Firth.

Of particular value for the north is the fine chart of 1325 by Angellinus de Dalorto (Fig. 3). Nothing is known of the author, but the workmanship indicates an Italian, perhaps Genoese, origin. A closely related chart of 1339 signed by Angelino Dulcert, although made at Majorca, is probably a copy of the earlier work. In these maps for the first time we find a completely finished outline for Great Britain, but although the northern coasts are indicated it is evident that little was known of them. Of poor shape and lacking in detail, Scotland leans so far to the west as to overhang Ireland, while a few scattered islands between represent the Hebrides. Few place-names are recorded, but the great circular island of Tile, off the north-east point, which was retained for more than two and a half centuries, makes its first appearance. A central castle-crowned mountain and two rivers separate Scotland from England, for which country the later Vescontian model was adopted with but little change, either in coastal outline or in place-names. Ireland, on the other hand,

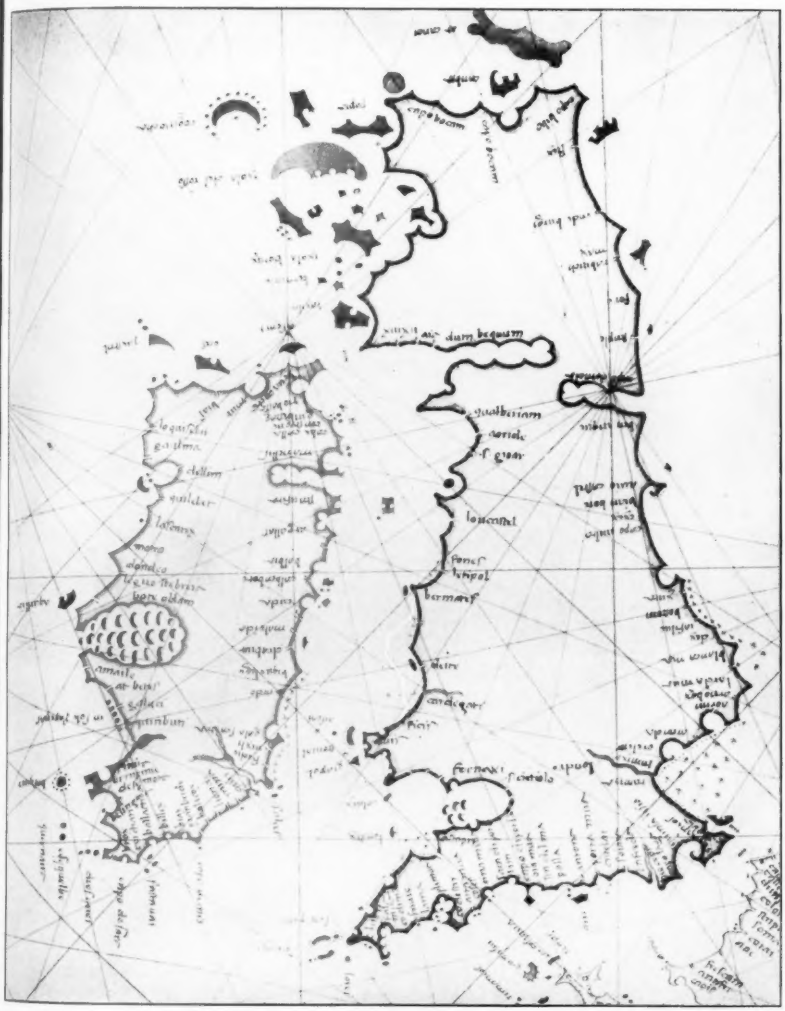


Plate I. Type IVb. c. 1489. *Anonymous Venetian*
London, British Museum, Egerton MS. No. 73, *Map* 29

agrees more nearly with the earlier form of 1321, although the nomenclature is fuller.

Some surprise may be felt when we find that the great maritime city of Venice was much more backward in the practice of nautical cartography than its rival in sea-borne commerce. It seems, indeed, that at first Venetians were content to borrow the charts and to employ the chart-makers of Genoa. Both Petrus and Perrinus Vesconte are known to have worked for some time at Venice, and it is said that they were consulted as to the best route to be followed when, in 1317, the government of that city organized the famous trading fleet known as "The Flanders Galleys." A few years later, in 1321, when Marino Sanudo the elder wished to illustrate the copy of his *Liber secretorum fidelium crucis*, which he presented to Pope John XXII. in support of his crusading propaganda, he would naturally seek out the most competent draughtsman; and Kretschmer believes that it was Petrus Vesconte who designed the required charts and mappa mundi (2). The remarkable similarity of an anonymous map of the British Islands in the London Sanudine codex to the signed work of Perrinus Vesconte would suggest that he also, at a later date, was employed on the same work.

Venetian dependence upon foreign sources for their nautical charts seems to have continued a long time, for in 1367 we find Franciscus and Marcus Pizigano of that city reproducing the Dalorto map of the British Isles without alteration. Towards the close of the fourteenth century, however, a distinctive Venetian type appears in the two anonymous collections known from their former owners as the "Pinelli Atlas" and the "Atlas of Nicolaus de Combitis" (Fig. 4).

Neither England nor Ireland in this map shows any improvement, although some new names appear in Scotland, which is completely separated from England and unfinished in the north. This uncertainty concerning Northern Britain is characteristic of all typical Venetian work, but charts dating from the fifteenth century do not adopt the insular form of the earlier examples. An interesting group of later Venetian origin is a series of eight charts and atlases by Jacobus de Giroldis; for both England and Ireland these follow the earlier Genoese series of place-names rather than the "Pinelli" example. The earliest, dated 1422, also follows the Genoese form for England, but the later examples from 1426 till 1448 adopt a characteristic representation of South Wales, the Bristol Channel and the Cornish peninsula, which is derived from a chart of 1408 by Pasqualini of Venice (Fig. 5).

Up to this point we have been concerned with Italian work, but nautical cartography was in an advanced state at an early date among the mariners of Catalonia. There can be no doubt that the official recognition given to the value of sailing charts by an ordinance of Peter of Aragon in the year 1354 had a stimulating effect upon their production (3).

As each war galley was obliged to carry two, considerable numbers must have been required, but none of these early examples have been preserved. The first work of the Catalan school now known is the great chart of 1375 from the library of Charles V., King of France, which, not being subjected to the accidents inseparable from use on board ship, has been preserved in a fine state of perfection. Probably the work of Abraham Cresques, the Jewish "master of maps and compasses" to the King of Aragon, rather than, as was formerly thought, of his son Jaffuda, who subsequently held the same office, this chart is based upon a model of the Dalorto type. It was not, however, copied directly either from this map or from its close relative the Dulcert chart, but from some similar work now lost. England indeed shows little change, but Scotland has been remodelled and much reduced in size. No boundary between the two kingdoms is indicated, but no further real knowledge of these northern parts is to be discovered. Ireland is unaltered and contains practically the same series of place-names, but the islands between it and Scotland are omitted. Founded by Jewish philosophers learned in astronomical and geographical science, the famous cartographical school of Majorca remained exclusively in the hands of their converted descendants for the next half-century. Cresques' model was followed by Soleri in 1385 and by Mecia de Viladestes in 1413 (Fig. 6). But towards the end of the first quarter of the fifteenth century the Catalan map of the British Isles underwent considerable alteration, and in its revised form was adopted by the cartographers of Majorca, of Italy, and indeed by craftsmen from all parts of the Mediterranean.

Although, of course, it is not possible to assign this revision with certainty to any particular hand, there is some justification for supposing that it was due to Battista Becharius of Genoa (Fig. 7). Not only are two of his charts, dated 1426 and 1435, the earliest known examples of this type, but Petrus Roselli of Majorca, in 1447, expressly records his obligation to Becharius (4). But the earlier Catalan cartographers, Gabriel de Vallsecha in 1439, and Petrus Roselli from 1447 till 1468, and the Genoese Bartolomeo de Pareto in 1455, copied the map of 1435 rather than that of 1426. In this map Great Britain is considerably wider relatively to its length, especially in the northern parts of England and in the south of Scotland, which is further extended towards the west by a great projection of the Galloway peninsula. No indication is given of any better acquaintance with the west coast of England and Wales, the outline of which remains very defective and lacking in place-names. On the east the estuary of the Thames is enlarged, and the shores of Essex, Suffolk, and Norfolk run in a straight line nearly north-west to the Wash, which is now placed only slightly to the north of the parallel of Holyhead. No separation of Scotland from England is indicated; two short river estuaries with a considerable tract of country, but no mountain, between them form the boundary. Ireland is little changed,

except that the northern parts are rather less sharply pointed and the great western gulf less elongated.

The great popularity of this type from the middle of the fifteenth century seems to have been due to the prolific and beautifully executed work of Gratiosus Benincasa of Ancona, of whose charts dating from 1461 till 1487 no less than twenty-two examples are preserved in the libraries of Europe (Fig. 8). Benincasa, although apparently of Catalan descent, did not follow the map employed by his countrymen, but adopted the earlier Becharius model of 1426. The principal difference between this chart and that of 1435 is the representation of the boundary between England and Scotland, which returns to the earlier type with a central mountain, but in a highly conventialized form. Two wide rivers discharging into the eastern and western seas are provided with the large circular sources of mediæval tradition, between which the mountain from which they flow is so tightly squeezed that it is almost unrecognizable.

Although beyond the period now under consideration, it is of interest to notice that a misunderstanding of this symbolic treatment led many cartographers of the next century to separate Scotland from England completely by an open sea passage, in which traces of the original mountain and river sources are sometimes retained as a central lake-like widening. Not only were the sixteenth-century chart-makers misled, but modern investigators have taken Benincasa's representation to indicate a complete insularity of Scotland, which was not intended (5).

This revised Catalan model of the British Isles became the standardized form of the fifteenth century. It was copied by Conte de Hoctomano Freducci of Ancona (1497–1539), by Georgio Sideri, called Calapoda, of Crete (1537–1565), and by many other cartographers from all parts of the Mediterranean for over one hundred years.

But at the same time that Benincasa was copying the revised Catalan model, another and entirely different representation of the British Isles appears in a small and little-known group of nautical charts (Fig. 9 and Plate 1). Up to the present only the smallest and most defective example has been reproduced (6), and the map has therefore escaped the notice even of those students who have paid any particular attention to the cartography of our island group. Its origin cannot be so clearly traced as that of the standard Catalan chart, but it seems probable that it also was the work of the Majorcan school, for two examples are signed by Petrus Roselli. But although Roselli employed this type in 1462 it is evident that it did not fully satisfy him, for in 1464, 1466, and 1468, he returned to the form used in his earlier work. The map indeed did not attain much success, but seems to have dropped out of use in the early years of the sixteenth century and survives in only eight examples. Although not widely employed by the marine chart-makers it must have had some reputation, for it was adopted by Bernardus Sylvanus in his edition of Ptolemy's Geography, published at Venice in 1511. Sylvanus, how-

ever, discarded the place-names of his model in favour of the ancient Ptolemaic series, which he fitted as best he could into the new framework.

In some respects an improvement upon the earlier types, the map was still far from correct in outline. Both England and Ireland are greatly elongated, but on the other hand Scotland is much reduced in length from north to south. The southern shores of England are little altered, and with few exceptions the earlier nomenclature is retained, but a considerably better acquaintance with the west coast is indicated. Here for the first time we find a number of place-names to the north of Milford Haven—Fishguard, Cardigan, River Dovey, Beaumaris, Liverpool, Furness, and Lancaster.

East Anglia has no better outline than in the older charts. The Wash is barely indicated, but a great beak-like promontory, probably representing Flamborough Head, breaks the northern coastline. The old names on the east coast, except Yarmouth, Blakeney, and Hull, are omitted and a new series is substituted, in which for the first time we find Maldon, Colchester, Cley, and Saltfleet. Boston appears in its modern form instead of as St. Botolph's town, and north of this comes Teesmouth. Ireland has been entirely remodelled, but its long and narrow form bears little resemblance to reality. The great western gulf is retained, but the north is finished by a horizontal straight line broken by a large inlet; Donegal bay in the west and Strangford Lough in the east are indicated. Many new names appear, amongst which may be noticed Teeling Head, Killybegs, and Galway on the west coast, and Glascarrig, Malahide, Ardglass, and Belfast on the east. In one of the later examples the Loughs of Foyle and Swilly are also named. The grouping of the Hebrides is new, and although still confused the great island of Lewis may be clearly recognized.

The intrinsic merit of this type will perhaps not be thought to justify the prominence I have given to it. But its importance in cartographical history as the first attempt to break away from traditions which had hampered portolan chart-makers for a century and a half must be admitted. In it we may recognize the precursor of those many and varied forms which are characteristic of the British Isles in the nautical charts of the sixteenth century.

(1) CHARLES DE LA RONCIÈRE, 'La Découverte de l'Afrique au Moyen Âge' (Le Caire, 1925), Tome I. § V.

(2) KONRAD KRETSCHMER, "Marino Sanudo der Ältere und die Karten des Petrus Vesconte," *Zeitschrift der Gesselschaft für Erdkunde zu Berlin*, Band xxvi. No. 4, 1891.

(3) PARDESSUS, 'Lois maritimes,' Tome V. pp. 432, 460.

(4) The chart in the Biblioteca Guarnaci at Volterra is signed: *Petrus Roselli composuit hanc cartam de arte baptistæ beccarii in civitate maioricana anno domini MCCCCXXXXVII.*

(5) For the development of the insular form of Scotland see a paper by the writer on "The Boundary between Scotland and England in the

Portolan Charts," in *The Proceedings of the Society of Antiquaries of Scotland*, vol. **12**, Fifth Series, Session 1925–26.

(6) JAMES A. WILLIAMSON, 'Maritime Enterprise, 1485–1558' (Oxford, 1913), p. 150.

NOTES ON THE SOLOMON ISLANDS

C. M. Woodford, C.M.G.

THE notes by the Rev. W. G. Ivens on the Spanish Discovery of the Solomon Islands, appearing in the *Geographical Journal* for April 1926, have recalled to my memory some few additional facts connected with the voyage of Mendaña which I acquired subsequent to the publication of the volume by the Hakluyt Society in 1901, and I am glad to be able to avail myself of the opportunity in making some comments upon Dr. Ivens's most interesting notes to place them on record, in the hope that they may be of some value in further elucidating points in connection with the Spanish voyage.

P. lxxviii. n. I can confirm Dr. Ivens's statement as to the plentiful occurrence of flints on Ulawa, where I found them abundantly scattered loose on the surface some distance inland. I went specially to search for them in consequence of Dr. Guppy's Note 3, p. 79, 'The Solomon Islands and their Natives.' This was on the occasion of my first visit to Ulawa in 1886.

The only flint implement in use by the natives in my time was the point of the drill, used among other purposes for drilling the disks of shell for making bead money. A description of the manufacture of this bead money I gave in *Man*, 1908, Article 43. The description explains how the fragments of flint are flaked off by pressure to form the pointed drill. One of the chief sites of the manufacture of the shell money was among the small island settlements off the coast of Mala, and I have reason to believe that the natives of these settlements procure the flint for their drills from Ulawa, for I remember when on an official visit to Langa Langa, a district on Mala, in 1908, I noticed a block of flint, the size of my two fists, in a canoe that was travelling along the coast to the north-west. Upon inquiry I was told that the flint came from Ulawa and was being taken to Auke for making drills.

Sir Hercules Read, formerly Keeper of Ethnology of the British Museum, to whose inspection I have submitted several of these drills, always referred to the material as chalcedony. I have seen and handled many hundreds of stone adzes and axes from the Solomon Islands, including many from Ulawa, but I never remember seeing one of flint or obsidian. The most common material is a hard black stone which I have always supposed to be basaltic, but I confess myself no geologist. The only deposit of obsidian in the Solomons with which I am acquainted

is upon Shortland Island. This is probably the deposit of which Dr. Guppy had information, but for which he searched unsuccessfully (*op. cit.*, p. 80).

Since the above was written I have referred the matter to Captain Joyce, of the British Museum. He writes as follows:

"We certainly have no obsidian or flint implements from the Solomon Islands. And in all my experience of collections, which now extends over nearly thirty years, I have never heard of any such."

With the exception of the drill referred to above, the only stone implement in common use by the natives of the Southern Solomons, during the time I was acquainted with them, viz. 1886 to 1914, was a small stone hammer, fitted to a flexible handle of cane, used for cracking Canarium nuts; but I did obtain on Guadalcanal in 1886 two or three stone adzes, hafted complete with wooden handles, so that they cannot long have been out of use. The use of adzes and heavy axes of stone continued on Bougainville Island certainly to as late as 1900.

Pp. xxx., 25 *n.* The suggestion that the natives of Ysabel pointed out the island of Mala to the Spaniards, saying "Mala-ita" or "Mala-eta" ("There is Mala"), was my own, and not that of the late Dr. Welchman, as Dr. Ivens supposes. The late Dr. Codrington in a letter to me disagreed with my theory, but I am glad to find that such an authority as Dr. Ivens is favourable to the idea.

Whence, I wonder, came the form Malanta? It is used by Captain Andrew Cheyne in his book 'Islands in the Western Pacific Ocean' (London, 1852). Bishop Patterson, Bishop Selwyn, and even Dr. Codrington always referred to the island under this name. Bougainville, Shortland, Surville, and Carteret had no communication with Mala, but it is possible that Admiral Dumont-d'Urville, in the expedition in the ships *Astrolabe* and *Lalée*, 1837–1840, may have been responsible. He certainly named certain mountain peaks and also the Begean Reef after the seaman who first sighted it. I have not the work at hand to refer to, nor any near library where it may be consulted.

As an example of misunderstandings which may occur when persons imperfectly acquainted with the native languages acquire the names of things or places, I will give an instance of what actually occurred in my own case. When, in 1886, I was making a rough survey of the north coast of Guadalcanal and the reefs between that island and Florida, I was in a boat one morning when I sighted a small sand cay at the extremity of a long line of coral reef. Owing to refraction it loomed in the distance considerably larger than it afterwards proved to be. I inquired of the native who was with me in the boat, the name of the island. He replied "*Pari Pile*" ("It is a small piece of dry land"). Down went the name in my note-book, and Pari Pile it remains in the chart to this day.

I am entirely responsible for the spelling Aola for the name of a village on the north-east coast of Guadalcanal, where I lived for several

months between 1886–1889, and I am still of opinion that my spelling more nearly represents the native pronunciation than does Aula. The name was always spoken "ore rotundo," and in a manner that the spelling Aula by no means conveyed to me. I always found the *o* sound distinctly expressed.

As to the name of the most easterly and densely populated island of the atoll named by Tasman Ongtong Java because it resembled a group of islands of that name situated near Batavia, I cannot accept Dr. Ivens's spelling Lungiua. It is true that in my book 'A Naturalist among the Head Hunters,' published as long ago as 1889, I used the spelling Lewenewa, but I have since seen the error of my way, and in a paper read before the Society (*Geogr. Journ.*, July 1916) I refer to the island as Luaniua. This orthography I did not arrive at altogether independently, but in consultation on the spot with the late Rev. George Brown, D.D., of the Wesleyan Methodist Mission, who visited Ongtong Java twice, once in my company, and we settled the question in consultation with natives who spoke Samoan, Tongan, and Fijian. The late Mr. Bolton G. Corney, with whom I corresponded up to the time of his death, was of opinion that the name "niua" was derived or had some reference to a place-name on the island of Rotuma, whence some outcasts may have drifted to Ongtong Java. Luaniua is the name of one island only, another at the western end is known as Pelau, and when the atoll is better known, names of forty or fifty other islands will doubtless be recorded.

I had already, in the paper above referred to, placed on record the name of the dangerous detached reef about 30 miles south of Ongtong Java, the Candelaria of Mendaña and El Roncador of Maurelle, which is known as Kewobua.

P. 351. Dr. Ivens says that a blue dye is no longer in use on Mala. It was, however, still in use by natives of Ysabel as late certainly as 1910. It is a vegetable dye resembling indigo, and it is used for colouring bark cloth. I forget the exact process, but I think I remember that the leaves are first wilted and then sprinkled or soaked in salt water. They are then chewed by the women. This produces a blue saliva which they spit or smear upon the cloth. I have also seen traces of blue decoration upon the prow of Ysabel canoes, which may be due to the same source.

The plant was identified for me by the Kew authorities as *Desmodium brachypodum*. The native name is Pau.

P. 356. Dr. Ivens is quite correct. The photograph described as "A man of Ulawa" is by some unfortunate mistake of mine that of a native of Guadalcanal, in fact, of Aola, and appears as such at p. 114 of my book. I greatly regret the mistake. However, there is no mistake about the native of Ulawa who appears in the frontispiece to vol. **2**, 'Discovery of the Solomon Islands,' and the plate further illustrates the breastwork of boards in front of the canoe house, referred to on p. 355.

There was a growing tendency at the time I quitted the Solomons in 1914, among white men at any rate, to refer to the whole of Ysabel Island as Bugotu. I need hardly point out that this was quite incorrect, Bugotu being the name of a small district only at the south-east end. No native would think of so referring to the island as a whole.

The Spanish discoverers recorded the name of the district surrounding what is now known as Estrella Bay, where they made their first landing, under variant forms. Thus Gallago calls it Cambra (p. 19), Catoira gives Cambano (p. 313), and Camball (p. 231) Mendaña (p. 112) has Samba, and Sarmiento (p. 87) Somba.

The still extant name of this part of Ysabel is Sambana. If, twenty-five years ago, a party of New Georgia headhunters had been asked where they had been, they would in all probability have replied, Sambana.

I recently wrote to Mr. S. G. C. Knibbs, Commissioner of Lands at Tulagi and a Fellow of the Society, asking him whether it would not be possible to prepare a map showing the correct boundaries of native names of districts, with special reference to Ysabel and Choiseul. Some I remember, *e.g.* Bugotu, Gao, Maringe, Sambana, Kia, Vuleka, Warise, Bambatana, Jerama. There are many others, but they have escaped my memory. In a few years it might be too late to rescue them from oblivion.

P. 20. A mistake occurs in the situation of Hakelake Island shown in the panoramic view of Estrella Bay. Hakelake Island, to which the natives retired with the remains of the body of the boy they had offered to Mendaña, is a very small low island on the sea reef. It is dimly discernible in the panoramic view as an indistinct blur on the horizon about five-eighths of an inch to the right of the rocky islet off the point of the bay. In my original photograph, from which the view in the book is somewhat reduced, it is much more evident.

P. 19. The rock of which the point of the mainland, opposite the small rocky island, consists somewhat resembles serpentine, and shows many cracks and fissures, and it is evident that falls have taken place. It was doubtless the fall of a large mass of rock from this point at the moment the *Capitana* entered the port to which Gallego referred.

P. 21. The native Meta whose name is constantly mentioned by Gallego and the other Spanish diarists, was the chief of a district to the south-east of Estrella Bay, apparently near what is now known as the Maringe Lagoon. The late Dr. Welchman, who knew the natives of this district well, informed me shortly before his death that the name of Meta was still used in an invocation in connection with the capture of the Hornbill.

P. 90. Sarmiento alone of the Spanish diarists states that the native name for the whole island of Guadalcanal was Gaumbata. This was not correct, but it is the name of a district on the north-east coast extending

along the coast in a north-westerly direction from somewhere near Ruavatu or Tasimboko. I am not quite certain of its extent.

Dr. Codrington gives it as a place-name in a map facing p. 522, 'Melanesian Languages,' but I never knew a village of this name. It should be noted that the name of one of the principal kemas of Guadalcanal and Florida is the Gaumbata. The token bird is the white cockatoo.

Another instance of kemas taking their names from places or districts may be cited in the case of the Hongokama, Hongokiki, and the Himbo.

I do not think there is any native name applicable to Guadalcanal as a whole, but I have been told, I think by a Savo native, that it was known as Kulengela, and by the Rev. Alfred Lombu—a native of Florida, an ordained priest of the Melanesian Mission, a man very well informed upon native affairs—that it was known as Laundare.

P. 47. Dr. Ivens states that the shields used by the natives of Ulawa were made of a piece of stout bark, stripped off whole. I have never seen one of these bark shields, but I know that they were also in use on Mala up to a recent period. They were, I am told, rather unwieldy, and rested on the ground, covering the whole body.

The best known type of shield, used by the natives of Florida, Guadalcanal, Ysabel, and the islands of what I term the New Georgia Group, including Simbo, Ganongo, Vella Lavella, as well as the large island of New Georgia, is made of wickerwork, and is of an irregular elongated elliptical shape. Numerous illustrations of this type of shield have been published. I may cite my own photograph on p. 356, above referred to as incorrectly ascribed to Ulawa, but really belonging to Guadalcanal. Julius Brenchley obtained a very fine decorated specimen at Florida, which is illustrated in his 'Cruise of the Curaçoa,' p. 281. Unfortunately, it is shown upside down. Such elaborately decorated shields were never seen in my time in the Solomons.

Another shield of this type but of unusual shape from Port Praslin, Ysabel, is illustrated on Plate VII., 'Discoveries of the French to the South-East of New Guinea,' by M. Fleurieu, 1791. These wicker shields, I am informed, are made in the bush on Guadalcanal and also in the interior of the large island of New Georgia, but there seems to be some mystery about the actual place of origin. They are articles of barter amongst the natives of the islands where they are in use. In fighting the shield was carried in the left hand, and a club, or later an iron-headed tomahawk club, in the right. The handle of this tomahawk measures about 3 feet 6 inches in length. It is generally referred to by white men as a long-handled tomahawk. The proper long-handled tomahawk was, however, 6 or 9 inches longer, and was used with both hands. Such a tomahawk appears in the hands of the Ulawa native in the frontispiece to vol. 2, 'Discovery of the Solomon Islands.' A native of Shortland Island, describing to me the superiority of the long-handled tomahawk over the shorter tomahawk and shield, told me of

a fight that occurred between the natives of Shortland Island and natives of the island now incorrectly called Eddystone Island, or Narovo, when 120 of the latter were killed, and accompanying his description with most vivid action, declared that "Long-handled tomahawk he win every time."

From Ysabel Island comes a shield of an entirely different type, although the wickerwork shields described above are also used on that island. I have deposited one or more of these Ysabel shields in the British Museum. The shield itself is a rectangular piece of bark or thin wood measuring a little over 3 feet in length and from 7 to 8 inches in width. It is curved, longitudinally, into the arc of a circle. An illustration of this form of shield is given by Mr. J. Edge-Partington in *Man*, 1906, Article 86, Fig. 1, Back of Shield A. In the case of the only specimens I obtained the front of the shield was undecorated, but the two examples illustrated by Mr. Edge-Partington in the article above referred to are coloured red and black on the face and ornamented with lines in relief formed by square pieces of pearl shell, set in a black resinous composition (the scraped kernel of the tita nut, *Parinarium laurinum*), forming a rectangular decoration. This type of decoration pertains especially to Ysabel Island, and is seen upon the bows of the Ysabel canoes. I have no hesitation in attributing the two fine shields illustrated by Mr. Edge-Partington to Ysabel Island as well as the decoration on the two wicker shields in the Cambridge Museum described and illustrated in *Man*, 1906, Article 21, by the late Baron Anatole von Hügel.

In the concluding paragraph of his paper, Dr. Ivens refers to a form of salutation used by the natives of Ulawa for the Three Sisters Islands. These salutations to places and chiefs appear to have been general. The only examples I have been able to preserve are in connection with places in the immediate neighbourhood of the Government Station at Tulagi, and were given to me by an old native of Savo sitting on the veranda of the Residence. He informed me that he had forgotten many others.

Pukanambua (the thumb rock near Bungana Island).

Tolu ko na ra . . . Ralaga na baloni. Sua na pururani. Dukiga na Koni. Lologa na gambuni. Bandiga na pukuni.

Bungana (Baranago Island).

Bungana meau meau. Meau Meau Kokolo. Siu Kaia beti. Koli thopo raige me.

Tinete (Baranago Point. The jumping-off place of departed spirits).

Tinete kiko kiko. Tinete mani mani. Tinete sula sula.

Tulagi (the island site of Government Station).

Tana Tulagi mate. Tana gaigaravu.

Baranago (the village).

Mani na kokonga bombo. Paige na kororo Losigene mavoro.

Kovana (a chief of Matanambana).

Kovana manina ni Kavaniara manina pili komburu sangua dato.

At the time of the Spanish discovery, Gallego states that the three low islands near San Cristoval, named by him Las Tres Marias, and now known as The Three Sisters, were densely inhabited. At the present time they are uninhabited and uninhabitable, except by crocodiles, mosquitoes, and robber crabs. It is probable that a certain subsidence has taken place in this locality since the time of the Spanish visit, sufficient to render the islands unsuitable for human occupation. Evidence exists that changes have taken place in the immediate neighbourhood. On p. xliii. of the ' Discovery of the Solomon Islands ' reference is made to a tradition I met with among the natives of San Cristoval of the former existence of an island between Ulawa and Ugi in the position now marked on the chart under the name of the Lark Shoal. In Dr. Fox's recently published and most valuable book ' The Threshold of the Pacific,' he has recovered not only the name of the lost island but a circumstantial account of its submergence in some sudden seismic catastrophe. This must have occurred some time previous to the Spanish visit, as no island is mentioned by Gallego as existing in this position, and on his passage from Ulawa to Ugi in the brigantine he must have sailed almost over it.

In conclusion, I desire to appeal through the Society to the Hydrographical Department of the Admiralty to amend the impossible positions at present allocated in the charts to Shortland's Eddystone and Cape Satisfaction. Both Dr. Guppy, in his book ' Solomon Islands and their Natives,' p. 278, and the late Dr. Rivers, F.R.S., in a paper read some years ago before this Society, drew attention to the mistakes, but so far as I know nothing has been done to correct them.

Shortland's description of the rock to which he gave the name of the Eddystone is so clear and the name so aptly bestowed that it is almost impossible to understand how the name can have been misapplied to the island known by the natives as Narovo (an island which rises in two places to over 1000 feet in height, and which Shortland named The Two Brothers), instead of to the solitary rock situated to the south of it. The mistake dates from early times, since Captain Andrew Cheyne, in his book above quoted, who traded at Narovo in 1844, refers to it as Eddystone Island.

Similarly Shortland's Cape Satisfaction was the south point of Narovo Island immediately opposite his Eddystone Rock, as clearly appears from the relative bearings of the two given in the account of his voyage. As it is, the name of Cape Satisfaction has been somehow incorrectly bestowed in the chart upon the low point running out from the south end of Ronongo Island, which Shortland can never have seen at all, as he passed many miles to the west of it. The full description of Shortland's voyage and his track chart may be found at the end of Governor Phillip's ' Voyage to Botany Bay ' (London, 1789).

VOLCANIC ACTION NORTH OF RUDOLF IN 1918

Capt. W. Pennefather Holland

DURING an expedition in the South-Eastern Sudan in the early part of 1918, I was detailed to make a post on the Lomogol river, and remained stationary at this point for a month (May 2–June 2). During this period the northern horizon was constantly "fogged" by dusty-looking smoke (a steady hot south-east wind blows daily in these parts). My men also reported "fires" and "tents" on the tongue of barren rocky land across Sanderson Gulf.

It was not till May 21 that I was able to account for the above observations and reports. Happening to ride out to a point about 2 miles south of Lomogol Post on to rising ground, the first foothills of Lubur Mountain, I was able to see the origin of the smoke above described and also the "fires" and "tents" reported by my men. At a point N.N.E. from my point of observation, and approximately 25 miles from it, rose very dense volumes of black and white smoke. I was unable at that distance to decide that this was steam, but it was extremely white. This appeared to pour up in a series of quick agitated clouds, as if it were being puffed out. Every five to seven minutes the quicker agitation would cease and give way to a heavier and denser discharge, which lasted about ten seconds. The actual crater was below the horizon, and it seemed reasonable to suspect that it was a ground crater and not on a hill.

When these larger discharges took place, two "blow-holes" across Sanderson Gulf, and approximately only 10 miles east of the point of observation, discharged a similar dense black smoke. The emission started and finished sharply, and there was no activity at all in the intervals, that could be observed.

The position of the volcanic activities described would suggest that they are a part of the Great Rift Valley volcanic system, and perhaps the most northerly active disturbances yet observed in that system. Teleki's volcano is still active, and Southern, Central, and North Island are reasonably supposed to be only very recently extinct. The writer considers them to be better described as dormant.

It is worth noting that the activity coincided with abnormal height of the lake.

The facts were carefully observed, at leisure, but from a long distance. Both crater and blow-holes were in Abyssinian territory, and too far distant to warrant my visiting them from a post liable to attack. But the regularity of the actions, both of the main crater and the blow-holes, the concerted action of the main crater and the blow-holes, the dense blackness of the smoke, the sudden action and cessation of action of the blow-holes, made it impossible that there should be confusion with fires, dust-storms, or other accidents. The tents reported by my men were two large rocks whose shining sides caught the afternoon sun.

Attached is copy of a sketch made at the time of the observation, and a sketch-map.

I have been to Lomogol several times since May 1918, and was last there in November 1921 on the occasion of meeting Major Hawkins, D.S.O., H.B.M.'s Consul for South-Western Abyssinia, but no sign

Sketch map to illustrate Volcanic Activity north end Lake Rudolf. Scale 1 in a Million.

of actual volcanic activity could be seen. Major Hawkins asked his Abyssinians if they knew anything of the matter, but they answered in the negative. They are not pleased to give any information on geographical points in, or adjacent to, Abyssinia.

In the year 1918, when these eruptions were observed, Lake Rudolf was very high. No observations of the actual rise and fall of the water

were taken in vertical measure, but the writer, who knows the western shores of Rudolf well, is able to state that in places the water flooded inshore to a distance of 1½ miles—*e.g.* at the mouth of the Kabua river and foot of Lubur mountain (see Map Turkana, North A–36 E. and F., North B-36 W. and X.); and, judging by other points where the shore falls steeply to the water, *e.g.* 11 miles north of the Kabua mouth, I should put the rise in 1918 at the large figure of from 15 to 20 feet.

North Island rose sheer out of the water in 1918, whereas in 1921 a spur of land attached to it was visible above water running in a southerly direction for about 2 miles.

Some stumps of dome palms averaging 10–12 feet high standing on the edge of the water in 1921 were not visible in 1918 at all. Quite a large stretch of these trees running a considerable distance into the lake are to be seen in normal years at the Kabua mouth, and must have been submerged quite recently.

In order to discover if possible the place of the main crater, I examined Mongasha Hailu, an Abyssinian soldier. A relief map having been prepared in the sand containing the chief features of the district—Mounts Lorienatom and Lubur, Nakua Hill, the rivers Kibish, Omo, and Lomogol, and the northern part of Lake Rudolf—it was carefully explained to Mongasha, and when he quite understood it the following information was obtained by question and answer:

He knew Nakua hill, and was present at the battle of Kangalla, south-east of Lorienatom on the Lumian river, in 1918. There was a lot of water that year at Kangalla. He knew the Murle country well. The people have a path across the water to the foot of Lubur mountain, but in some years the water is too deep to cross. He had seen smoke coming out of holes in the ground in the Murle country, and with great excitement made noises of rapid blowing and sucking, followed by a long roar. He had seen a large hole north of the Murle towards the Omo river, but was surprised at being asked about it, as very few people ever go there. He had been close to it, but was afraid to stand on the edge, and could not see it properly. It was perhaps 100 to 150 metres across. (He had been engaged on making a canal marked out in 25-metre sections, and could estimate 100 metres pretty well.) There are other smaller holes near the Omo river. The mouth of the large hole is not on a hill, but about three hours east [? west] of some small hills called Jinjibil. The Jinjibil Khor coming from these hills passes half an hour north of the hole, which is about five hours from the mouth of the Omo river. The crater is always active, and becomes violent when there is very high water in the lake, or when Jinjibil Khor runs in the rains. Large clouds of steam come first, and black smoke when there is an explosion, but no stones or mud. The crater is nearer the Omo than the Kibish.

The above is summarized from the record of question and answer.

Most of Mongasha's answers were long, with much irrelevant matter; but care was taken to record all that bore on the subject, and the whole record was read over to him. Major J. A. de Courcy Hamilton, D.C. Kassala, checked all the answers and confirms the record.

Note by the Editor.—We think that Captain Holland is right in supposing that no active volcano has been observed before quite so far north in the rift valley. It is interesting to compare his account with that of Mr. H. S. H. Cavendish for the volcanoes at the southern end of the lake (*Geo. Journ.*, 40, 390, April 1898),

> "On arriving at the south end of the lake, I was surprised to find that Teleki's active volcano had entirely disappeared, its place being taken by an absolutely flat plain of lava. We got hold of some Ligob men who lived at the south end of Lake Rudolf, and within a couple of miles of the volcano, who told us that about six months ago the lake overflowed, and as the waters rushed towards the mountain—the native name of which is Lubburua—there was a vast explosion, after which the waters swept in where the crater had been and put out the fire. Since that time there has been no sign of the crater in that place, and there is now only a vast field of cold lava running right down into the lake; but a new crater has opened about 3 miles due south, the native name of which is Luttur. This has only just lately become active, and some of the Ligob people, who have ascended to the edge of the crater, report that there is a fire in the inside, and even we ourselves during the night could see the glare over the mountain. The new crater is as yet not more than about 130 feet high, but the cracks and crevices in the lava did not permit of our ascending."

The connection between the height of the lake and the volcanic activity reported by Mr. Cavendish is strikingly confirmed by Captain Holland, who in speaking of Teleki's volcano as still active may perhaps be referring to Luttur.

Major Athill (*Geo. Journ.*, 56, 363, Nov. 1920) briefly refers to Nakua as "a striking serrated ridge of volcanic origin, with at least one interesting crater," but makes no mention of activity, or of any crater in the plain.

Mr. J. H. Driberg has called our attention to a reference, which is evidently to the same eruption, in a paper on Turkana by Major H. Rayne (*Journal of the African Society*, vol. 18, p. 264). Towards the end of May 1918 smoke by day and a glow by night were seen both from Lomogol and from 40 miles south; but the writer was unable to ascertain that these were volcanic.

KILIMANJARO AND SOME OBSERVATIONS ON THE PHYSIOLOGY OF HIGH ALTITUDES IN THE TROPICS

D. V. Latham, M.B., Medical Officer, E.A.M.S.

KILIMANJARO is a mountain which enjoys certain distinctions that enhance its interest not only to the climber but also to the physiologist. I make no claim to be numbered among the former and certainly none to the latter title; nevertheless, the interest I take in my profession prompted me to make certain observations during my ascent and to draw inferences from them in my own untutored way. The physiology is so intimately interwoven with the climbing that I needs must make one fabric of the two, and this I lay before you.

Two hundred miles from the east coast of Africa and three degrees south of the equator, as any atlas shows, stands the mountain. There are two peaks—Kibo, the big brother, white-mantled and smooth of countenance; and Mavenzi, the lesser companion, jealous of the other's size, twisting its crest with fissured crags, showing all its rocky teeth with needle-pointed sharpness, achieving grandeur if not grace.

My climbing companion, R. von Dechend, and I had been resident for some months at an altitude of 4000 feet, and, although this is no considerable height, it had given us a few more red blood-cells than those on the coast. I will digress from my narrative to support the theory put forward by Kestner (1) in as far as he suggests that a tropical sun will cause an increased red blood-cell count in a normal individual. "The effective factor of high climate is not diminished oxygen content but the increased and more intense irradiation of the sun's rays. By the effect of rays substances are formed in the air which stimulate the formation of red blood-corpuscles if they (the rays) are inhaled." The tables which follow show that in our experience, even though sufficient time did not elapse between the different altitudes for the red blood-cell count to become steady, we showed an increase above the average number for each particular altitude found by observers in temperate zones. If the red blood-cell increase is a proportional index of oxygen-carrier requirement for any given conditions, it follows that the oxygen want in the tropics is greater than out of them; but if this assumption be not true, then the erythrocytosis of the equator should render the attainment of high altitudes in these regions easier than away from the vertical noontide sun. As my narrative will show, we had more red blood-cells than the Everest climbers for corresponding altitudes; but nevertheless mountain sickness prevented one of us from reaching the summit and caused the other quite appreciable discomfort. An incomplete deduction is that the red blood-cell requirement for any altitude is greater on Kilimanjaro than in the Himalayas.

Kibo from Hans Meyer Cave
(Identification of notches by Mr. Gillman)

The Crater of Kibo from "Leopard Point"

Gillman's and Stewart's flags at Johannes Notch (Hans Meyer & Latham)

The Crater of Kibo from Kaiser Wilhelm Spitze. (The identification of Hans Meyer Notch from paper by C. von Salis, 'Die Alpen,' Aug. 1926)

Kibo rises to an altitude of 19,710 feet, and the ascent from the plains at Moshi is very gradual. The summit could be reached in three days were the climber fit enough and acclimatization sufficiently rapid, but we climbed more slowly. The journey of 30 miles from Moshi to Marangu, on the foot of the mountain, is gradual and pleasant, and a motor car should not take more than two or three hours to negotiate it. Our camp at Marangu, altitude 4500 feet, is situated among the native shambas. The luxuriant crops of bananas, beans, and maize which the fertile foothill soil produces cover the face of the mountain-side. At Marangu it is customary to engage guides and porters; we had two guides, one of whom, Offoro, deserves special mention. I do not hesitate to state that for a native he is an excellent guide, combining the qualities of being able to find his way with certainty, physical endurance, and good nature. Our porters numbered fourteen; this is a large following, but cannot be conveniently reduced. Six of them were carrying their own food. We slept the night at Marangu and left at eight the next morning for Bismarck Hut. At first the path winds through the native shambas, but an hour out of Marangu the forest belt begins, and one leaves the zone of human habitation. It is a very gradual climb of four hours to Bismarck, which is at an altitude of 8400 feet, just at the upper limit of the forest belt. The hut is a well-built stone building with three rooms. It must have been very comfortable at one time, but the vandal's hand has fallen heavily on its easily removable or destructible components, and now it affords shelter but no comfort.

The path ascends gradually from Bismarck Hut, and for half a mile traverses a patch of forest of trees festooned with beard-like parasites which give them a ghostly appearance. We passed through this in the early morning of June 29. It was a warm morning. Below us the clouds lay at about 7000 feet; above and around all was clear. Emerging from the forest one tops a rise and suddenly has the most exquisite view: Kibo, snow-capped and serene, on the left; and Mavenzi, rock-cragged and cruel, on the right, with the billowing slopes of grass between. By easy gradients one ascends diagonally round the base of Mavenzi to Peters Hut, at an altitude of 11,500 feet. This stage takes four hours of easy and delightful walking. I arrived feeling perfectly fit, but on attempting to sleep in the afternoon, was prevented by palpitation, which was at once relieved by sitting up. By the evening I had developed a decided frontal headache, found it a considerable strain to do the blood counts, and was quite unable to stand the ordeal of the breathing tests; but my companion was quite fit. I had a fair night, and awoke refreshed and fit ready for the next stage, a climb to the saddle between the two peaks, and across the saddle to Hans Meyer's cave on the lower slopes of Kibo at an altitude of about 15,000 feet. The vegetation ceases to produce fuel 500 feet higher than Peters Hut, and disappears entirely but for a few straggling plants of white everlasting and a small

yellow daisy-like flower which persisted to the cave. The porters collected firewood and water for our stay at the cave half an hour beyond the hut.

The saddle between the peaks is a desert of loose sand and stones, and from the foot of Mavenzi, where one tops it, stretches gradually upwards for about 3 miles to the cave. Climbing slowly we reached the saddle in about two hours. During this period my frontal headache returned, and when we reached 15,000 feet both of us felt slight nausea and decided cephalagia—the first undoubted symptoms of mountain sickness. Contrary to expectation, the nausea was worse when resting than when walking, and even moderate uphill progress produced no marked palpitation or breathlessness. Here then were two of the classical symptoms of mountain sickness in a mild form without the essential manifestations of oxygen-want being present, which would appear to be contrary to Barcroft's theory that "mountain sickness is due to oxygen-want, and oxygen-want is the discrepancy between oxygen-supply and oxygen-demand." (2). Our oxygen-demand was surely greater when walking uphill than when resting, and yet our mountain sickness was relieved by walking.

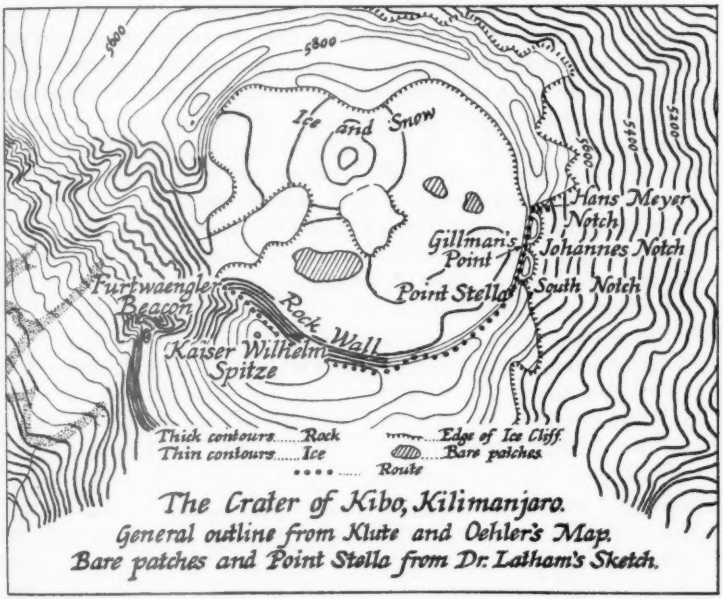
Crossing the saddle in the bright sunshine with the barometer showing an atmosphere three-fifths of the density at sea-level was most enervating, and we made the cardinal error of following the example of our porters and lying full length in the sun to rest at frequent intervals. At the cave we deposited our loads, rested a little while I toyed with some bread and cold tea—I could not face food seriously, and my companion could not even do this—and then retraced our steps very slowly to Peters Hut. On the return journey my companion parted with his breakfast, his head grew worse, and by the time he reached the hut he was collapsed and could barely tumble into his bunk. My own condition rapidly improved as the atmospheric pressure rose, and barring a slight headache I was perfectly fit at the hut.

The following day we rested at the comparatively low altitude of 11,500 feet, but my companion did not improve. Although the nausea left him he had no appetite, and the palpitation and headache continued. The evening of our return his temperature in the mouth was 100° F.

On the morning of July 2 we returned to the cave, but this time we did not lie down in the sun and we wore dark glasses. Both of us arrived perfectly fit, but by the evening my companion's headache and palpitation had returned to such an extent that he was quite unfit for climbing. He remained at the cave the whole of the 3rd, but as he had not improved by the morning of the 4th he returned to Peters Hut alone. During this second visit to the cave I had no discomfort of any sort, and I ate and slept well. I decided to take the mountain gradually, so on the 3rd I went only as far as the crater rim, reaching a point 300

yards to the right of Hans Meyer's notch * about five hours after leaving the cave. Here I suffered from all three of the cardinal symptoms of mountain sickness for the first time (altitude approximately 19,500 feet), headache, dimness of vision, and nausea which was brought to a crisis by the effort of opening the camera stand, when I vomited twice. I do not think I could have reached the summit that day if I had tried. At this point I found no record of previous visitors. My guide informed me that Coke had been there, but was too sick to leave a record. A remarkable discovery was the remains of a leopard, sun-dried and frozen, right at the crater rim. The beast must have wandered there and died of exposure. I built a small beacon and recorded my visit therein.

My final attack on Kibo was made on July 4. We rose at 4.15 a.m.



The Crater of Kibo, Kilimanjaro.
General outline from Klute and Oehler's Map.
Bare patches and Point Stella from Dr. Latham's Sketch.

and left the cave at 5.35, fortified by a good breakfast. The party consisted of Offoro and Jonathan, guides, Johannes, a porter, and myself. The first carried the rope, the second the rucksack, weighing about 4 lbs., and the third two water-bottles; I was unencumbered. The morning was fine and clear, with no cloud above 8000 feet. It was not cold, as there was no wind, and the thermometer registered 32° F. We pro-

* See Mr. Gillman's note following the paper for the opinion that the leopard was found at Hans Meyer's notch, and that the notch which Dr. Latham calls Hans Meyer's is Johannes' notch.

ceeded slowly and reached the height of Mavenzi, 17,400 feet, in 1 hour and 45 minutes. Immediately to the left of the highest ice-pinnacle visible from the saddle is Hans Meyer's Notch.* (My terminology of the various points round the crater rim of Kibo is arbitrary and used for convenience of description only. I do not know whether any names have been assigned and accepted.) My route to this point was from the saddle to 17,000 feet, up the central moraine, then on the rock partition to its immediate left and just below the notch, to the crater rim. There was remarkably little snow, and apart from a few small pockets none was encountered until 100 feet below the notch. Projecting from the snow-slope and just below the crater rim is a 20-foot rock pinnacle, which is just below Hans Meyer's Notch,* and is a visible landmark even from the saddle.

I reached Hans Meyer's Notch in just under five hours from the cave. Progress over the last 500 feet was extremely slow owing apparently to the immense amount of energy needed in dragging the body up the slope; but apart from the breathlessness this caused I suffered no inconvenience, and arrived at the Notch perfectly fresh. The average angle of ascent from the cave to 17,400 feet is 15°, from there to the crater rim 25°, but the last 500 feet is considerably steeper—30° to 35°. Behind Hans Meyer's Notch and immediately to the right when facing the crater is Gillman's Point,† a rock pinnacle 20 feet high, where repose what I take to be a complete record of the ascents to this point since West climbed the mountain in 1914. They are as follows:

C. Gillman and Paul Nason	19 Oct. 1921
F. J. Miller and C. H. Stewart	9 Mar. 1925
Estella M. and Kingsley Latham, M.C. of S.A.	13 July 1925
Louis Cuisinier, C.A.F., Paris	22 July 1925
G. Londt, M.C. of S.A.	5 Nov. 1925
D. V. Latham, M.C. of S.A.	4 July 1926

I rested for an hour at the Notch, taking photographs and compass bearings. The natives had a meal, but I contented myself with cold tea and chocolate. I decided that Kaiser Wilhelm Spitze, the highest point on Kibo, was on the rock wall opposite. I could see no point that answered my then idea of a "spitze" or needle which could be the highest point. I only learned subsequently that a "spitze" is a summit irrespective of its shape.

I left the porter Johannes on Gillman's Point with instructions to watch our progress and what to do in case of an accident. Leading, followed by Offoro and Jonathan, my guides, I stepped on to the outer ice-wall of the crater which falls away at angles varying between 5° and 20°. Our line of progress round the ice-cap varied between level and

* See preceding footnote.

† See Mr. Gillman's note following the paper, and his reasoned objection to the name suggested by Dr. Latham.

10° upwards. About 150 yards from Gillman's Point we passed an insignificant rock point projecting into the crater, and 150 yards beyond this is a very distinct promontory, higher by a few feet than all its immediate surroundings and projecting well into the crater. I noticed a beacon, and left our route on the outside of the crater wall to examine it. The beacon of a few stones rests on the bare rock point. There is a fairly sheer rock wall about 40 feet high dropping down from this point into the crater, where it terminates in an ice-slope. This is the point reached by Estella and Kingsley Latham on 13 July 1925, and named by them Point Stella. I cannot corroborate their compass bearings. I found from this point that Gillman's Point bore 65°, and the reverse check on return was 250°, an error of 5° only, which is not great, as I was only using a Mark VI. army compass. Kaiser Wilhelm Spitze bears 260° from Point Stella, and the reverse from K.W.S. was 80° with no error. I do not think I made an error of 30°, so I cannot support their bearing of "290° E. of N., *i.e.* 70° West." With the clinometer K.W.S. was 7° higher and Gillman's Point 5° lower than Point Stella. The reverse readings corresponded. The accompanying (1) sketch-map and (2) elevation will elucidate.

At Point Stella I vomited for the first time that day, but I felt very little discomfort in spite of this. For the next 500 yards or so the going was good, the snow was hard and crisp, and the climbing gradual. There were some very beautiful holes in the ice with overhanging walls, and penetrating to a great depth. Following the advice of my guide against my better judgment, I made the mistake at this point of working on to the inner side of the crater wall. Here the ascent became steeper and the snow was only a few feet thick over the rock, and was in consequence cut into deep grooves, and a considerable effort was needed to pull oneself through. After a tiring half-hour, during which time Jonathan almost gave in, we regained the top of the wall 500 yards further on. A 200-yard slope on hard snow brought us to the beginning of the rock wall. Three hundred yards or so along, the rock wall, which is nearly level, slopes away gradually on the outside covered in ice and snow, and drops sheer into the crater on the inside and is practically bare, we came to a beacon of stones about 2 feet high and on the crater edge of the wall.

A record in the cairn contains in German accounts of the ascent of Carl von Salis and Walter von Ruckteschell on 13 February 1914.

Lying on the bare rock beside the beacon I found a stick which had been much exposed to the weather. The metal head broke off when it was lifted, and still remains embedded in the ice. This is the stick West left against the beacon when he successfully climbed the mountain in July 1914. This stick I built into the beacon as a permanent record. This beacon is the summit of Kibo, Kilimanjaro—Kaiser Wilhelm Spitze—the highest point in Africa, and its altitude is, I believe, 19,710 feet. My party reached this point a little over two hours after leaving Hans

Meyer's Notch, where we first struck the crater rim. The going was extremely good, and considering the altitude we made good time. With my clinometer I determined the following angles from K.W.S.: Point Stella, 7° lower; Gillman's Point, 7° lower; opposite ice wall only 1° lower; far end of rock wall just a fraction lower.

The narrow margin of this last reading determined me to visit the end of the wall. Here I found a beacon of a few stones and in a small tin these names, as well as I could decipher them: Walter Furtweing [Furtwängler], 3 Dez. 1912, and Siegfried Hornie [Koenig], 3 XII. 1912. I endorsed the German record and left my T.T. helmet badge in the tin. We spent about three-quarters of an hour on the summit taking bearings, relative altitudes, and photographs. The air was not uncomfortably cold, and apart from a few wisps of cloud floating in and around the crater, visibility was good; but the lower cloud belt hung at about 12,000 feet, and the plains were not visible. I felt no physical discomfort; my pulse rate, resting, was 76, and my respirations 20 per minute. The descent was easy and uneventful, interrupted only at Point Stella and Gillman's Point to verify my readings on K.W.S. now that I was certain of its exact position. We reached the cave by 5.30, and Peters Hut by 7.30 in the dark.

On the 5th and 6th we rested at Peters, and by the 7th my companion was sufficiently recovered for us to make a combined attack on Mavenzi. Our guide Jonathan gave us to understand that he had accompanied the German climbers Klute and Oehler, who made a successful ascent in 1912, and that he knew the route. In this, as he later admitted, he misled us. Offoro had been on the summit of Mavenzi's south peak in 1925 with Londt. Our object was to climb to the highest point on Mavenzi—Purtscheller Peak. The mountain consists of three separate rock masses, the South mass, the Purtscheller mass, and the Weismann mass, each split up into a number of needle-pointed summits. From below it is difficult to determine which is the highest point, as from every angle the mountain presents an entirely different aspect. Only when on Kibo was I able to determine with certainty which was the highest point, for then I was above Mavenzi.

We attacked the mountain from the saddle and proceeded up the central moraine, which is below the central or Purtscheller mass. There was only a small quantity of hard snow on the right upper edge of the moraine under the shade of the rock faces. The climbing was extremely arduous. The sand and stones are at a critical angle and roll away from under the feet with little provocation. About halfway up the moraine the main buttress of the central mass rises sheer from the loose stones. We made for its base and skirted it for a few hundred feet. From this position we were unable to ascertain the climbing possibilities of the rocks above. Jonathan pointed out a small gulley in the buttress and said it was the route.

The gulley was covered in smooth hard frozen ice, but did not look difficult. Placing implicit faith in our guide, we climbed up the gulley. The first 40 feet proved easy; we traversed to the right to avoid an impossible overhang, and then, my companion leading, ascended some difficult rocks for another 60 feet. I came up on the rope. We beat about for some time trying to find a possible route (our guides by this time had retired to the moraine), but found none, and were forced to retreat—no easy matter; and had we not found a fortunate belay our position would have been critical. Before we determined that there was no possible route where we had attempted, we had wasted three hours and much energy. There was not sufficient time for us to retire and map out a new route of our own, so we proceeded up the moraine to its apex. We could see no feasible route to the right, so we climbed easy rocks to the left, hoping that if we reached the left summit of the central mass we would be able to traverse on to its highest point to the right.

Without difficulty we reached the southern summit of the central mass and could overlook the South Peak. Through our glasses we could make out a beacon of stones. Our guide Offoro, who had been there with Londt in December 1925, told us it was his beacon. We made an attempt to reach the highest point by a traverse, but were repulsed. The eastern side of the mountain opposite from Kibo is absolutely sheer, dropping away for thousands of feet. The edge of the summit is deeply serrated by knives of rock only a few feet thick and precariously piled up perfectly sheer to heights of 40 and 50 feet. We built a small beacon on the point reached, which is about 100 feet lower than the highest point and about 100 feet higher than the South Peak, and in it recorded our names.

Mavenzi is a far finer mountain than Kibo; it has a thousand interesting climbs, and the magnitude of the drops on the east side is unapproached in our experience. The view of Kibo, 5 or 6 miles away to the west, is unequalled by that from any other point, and we were fortunate enough to see it in many moods as the day passed. The snow-capped dome, now partially obscured by swirling mist, now clear and brilliant, was a thing of beauty never to be forgotten. Mavenzi offers climbing for the cragsman which would be hard to equal anywhere, and we cannot believe that its scenic grandeur is surpassed by that of any mountain.

The descent is easy and rapid, and in two and a half hours we were back at Peters. Surveying the mountain from the saddle on our return, it would seem that a feasible route exists to the extreme right of the central mass and not up the central moraine. This route would traverse what is the sky-line from the point where the path tops the saddle. It is, however, conjectural only that one could reach the summit that way; but had we had time enough we would have made our second attempt from that side.

The following day we returned to Moshi by way of Johannes Hut

and New Moshi, a hard eight hours' slog. In the forest belt we stampeded a herd of elephant.

Kibo is an easy mountain presenting no climbing difficulties. It is technically only a walk, and there are no gradients over 35°; but it is nearly 20,000 feet high, and at noon the sun has an inclination of only 3° from the vertical in mid-winter. Strangely enough, mid-winter appears to be the warmest time of the year on the upper part of Kilimanjaro, and the weather is then most settled. Climbers at other times of the year report the mountain snow clad as low as 16,000 feet and even lower, the summit clear of mist for only a few hours in the early morning if at all; but for the whole of the ten days we were on the mountain, and a party we met descending stated that for ten days previous to that, Kibo had not been obscured at all except by the lightest clouds, and that only for short periods, and the snow was only general at 19,000 feet. During this period the mountain was not once visible from the plains, the cloud belt varying between 6000 and 12,000 feet continually, giving the erroneous impression from Moshi that weather conditions were unfavourable for climbing. July I think must be the ideal month for Kibo: we could have wished no better conditions.

The primary object of the expedition was to reach the highest point in Africa, and in this it was successful. The physiological observations were at all times secondary to this, and as the conditions were extremely rough, especially at the higher altitudes, they are naturally very sketchy.

Respiration and Circulation.—Shortness of breath made itself felt first at 12,000 feet, but was never very distressing even at 19,000 feet. Acclimatization of respiration was the most marked accommodation to reduced pressure we noticed. Breathing was less distressed at 18,000 feet on the 4th than at 15,000 feet four days previously; but from 18,000 feet onwards, especially when the gradient was steep, the respiratory rate rose rapidly while climbing, and it was necessary to stop and rest for a minute after each 40 paces or so; but as only a few hours were spent at the highest altitude, acclimatization could not be expected to have been effected. However, when resting at 19,700 feet the respiratory rate was only 20 per minute, and there was no suspicion of distress. I noticed Cheyne Stokes respiration in my companion while resting at 15,000 feet.

The power of holding the breath is not, in my opinion, a good test. One can train to the extent of a 25 per cent. improvement in the course of a few days. I give my table for what it is worth:

Breath held	At 4,500 feet	75 seconds.
	„ 8,400 „	64 „
	„ 11,500 „	40 „
	„ 14,700 „	49 „

The expiratory force of the lungs for any individual varies with the method the subject adopts for blowing. My table does not show any

marked variation at different altitudes. The test is chiefly one of physical fitness.

Expiratory force	At 4,500 feet	158 mm. of mercury.
	„ 8,400 „	122 „ „
	„ 11,500 „	144 „ „
	„ 14,700 „	138 „ „

The pulse rate during rest at varying altitudes was not markedly altered. On exertion at 18,000 feet palpitation became a hindrance to progress, but a rest of two minutes brought the pulse rate down to normal. During the early stage of the climb as low an altitude as 11,400 feet caused sufficient palpitation to interfere with sleep, but strangely was relieved by sitting up or walking about the hut. My companion had a normally intermittent pulse; the intermissions were very marked during the endurance tests, which consisted of blowing a bag to pressure 40 mm. of mercury and maintaining it at that pressure as long as possible. During the endurance test the pulse rate was counted for each period of 5 seconds. We did not find so marked a slowing as did Major Hingston on Mount Everest.

Pressure maintained at 40 mm. of mercury	At 4,900 feet	68 seconds.
	„ 8,400 „	43 „
	„ 11,500 „	20 „
	„ 14,700 „	30 „

Endurance Test.

Pulse rate in five-second periods

R.v.D.

4,500 feet	5·5·3·7·7·7·7·5·4·4·4.
8,400 „	9.8.6.5.5.5.7.7.5.3.

D.V.L.

4,500 „	6.6.6.6.7.8.8.8.8.8.8.7.7.
8,400 „	7.7.6.6.7.7.7.7.
11,500 „	6.7.7.7.
14,700 „	7.7.6.6.6.

The blood pressure did not vary with altitude.

Red Blood-cell Count.

Date.	*Altitude.*	*R.v.D.*	*D.V.L.*	*Offoro.*	*Mount Everest* (3).
June 27	2,500	6,600,000	6,550,000	5,800,000	5,000,000
June 28	8,400	6,750,000	7,270,000	6,750,000	6,040,000
June 29	11,500	7,050,000	7,850,000	6,850,000	6,760,000
July 1	11,500	7,900,000	7,700,000	6,475,000	6,760,000
July 5	11,500	8,000,000	8,725,000	7,440,000	6,760,000
—	15,600	—	—	—	7,840,000
—	16,900	—	—	—	7,640,000
—	18,200	—	—	—	8,320,000
July 9	4,500	8,650,000	7,450,000	—	5,240,000
July 10	4,500	7,900,000	6,950,000	—	—
July 15	4,500	—	6,800,000	—	—
July 25	4,500	—	7,020,000	—	—

Between July 1 and 5 R.v.D. had been at 15,700 feet for three nights. D.V.L. had slept at 15,700 feet for three nights and had ascended to 19,400 feet and 19,700 feet on successive days, reaching the greater altitude eighteen hours before the blood count of July 5. Offoro had done the same as D.V.L. It can therefore be roughly assumed that R.v.D. on July 5 represented red blood-cell count for 15,700 feet, and that D.V.L. and Offoro for that day represents red blood-cell count for roughly 19,000 feet. An interesting feature is the slow decrease in red blood-cell count on returning to 4500 feet; R.v.D. even continued to increase for one day on return. The question arises as to how long would it have taken at any altitude for the red blood-cell count to reach a steady maximum for that altitude? The rapidity with which the system can manufacture red blood-cells is marked; to produce over 2,000,000 red blood-cells per cubic mm. in eight days is marvellous.

Muscular power was markedly diminished at 19,000 feet. It required far more energy to raise the feet in climbing a steep gradient than would have been expected. We felt that it would have been impossible to have performed any feat requiring all one's muscular power, such as heavy-weight lifting, and even such simple operations as unfastening a ruck-sack or unfolding a camera stand caused appreciable exhaustion. The mentality also was markedly diminished at 19,000 feet. I determined to count the number of paces from Kaiser Wilhelm Spitze to Hans Meyer's Notch on the return trip, but found my mind wandering so much that I had to give it up. I wrote an entirely irrelevant report and placed it in the beacon at Gillman's Point; my memory was not as sound as I had hoped; and I found difficulty in calculating the difference between compass readings taken in reverse directions. I found it necessary to write every reading down at the time and check them against each other at a lower altitude.

The first time I reached the crater rim I suffered from a distinct impairment of vision. I had with me a photographic exposure meter which required the operator to examine the object to be photographed through it, shutting down the diaphragm until a number was only just visible. I found that I had been giving my films about six times as much light as they needed. This impairment of vision was a manifestation of mountain sickness, and was not present on my second visit to the crater the following day, when I was not suffering from this complaint. The expedition lasted barely ten days, and I was in good training at the commencement. Unfortunately, we did not weigh ourselves before or after the trip, but all my friends avowed that I was decidedly thinner on my return from the mountain.

Mountain sickness is in my opinion the greatest obstacle, after bad weather, to the attainment of the summit of Kilimanjaro; but even in a susceptible individual otherwise physically sound this disability should be satisfactorily overcome by a sufficiently prolonged acclimatization.

As my narrative shows, the length of time required for acclimatization varies considerably with the individual. One of us was able to reach 19,700 feet six days after arriving on the mountain without discomfort, while the other was so mountain sick at 15,000 feet that he had to return to 12,000 feet for two days' rest, but was then able to climb to 17,200 feet on Mavenzi without any sign of mountain sickness. A striking confirmation of the fact that persons who have previously attained high altitudes acclimatize more effectively than new-comers is found in the case of our guide Offoro, who the previous year was so mountain sick at 16,000 feet with Kingsley Latham that he had to go back to 12,000 feet, on this occasion reached the summit without a trace of mountain sickness. To suffer the minimum discomfort from mountain sickness, I advise climbers to ascend that section of the mountain above 12,000 feet in such stages that it is possible to sleep at a lower altitude than the maximum attained the same day. A graphical representation of time and altitude would look like the beginning of a typhoid fever temperature chart.

So little is known of the nature and causes of sunstroke that it is unwise to venture too much. But assuming that sunstroke, whatever it may be, exists, it is presumably caused by certain of the sun's rays. and further that these rays are absorbed by the Earth's atmosphere in direct proportion to the amount of air interposed between the sun and the Earth's surface. Now, at the coast in the tropics the sunstroke rays traverse on an average a thinner layer of air at midday than in a temperate zone owing to the fact that the sun is more vertical. So we are told that one is liable to get sunstroke unless suitably protected (no one knowing exactly what substances are opaque to the sunstroke rays or what substances are conductors). How much more should one be liable to sunstroke at 19,000 feet in the tropics, where the sun's rays have the added advantage over one of having to traverse only one-half the atmospheric air as at the tropical coast! It would seem that one should take special precautions against sunstroke in an attempt on Kilimanjaro. Perhaps my companion's disability was sunstroke and not mountain sickness. "Who shall decide when doctors disagree?"

REFERENCES.

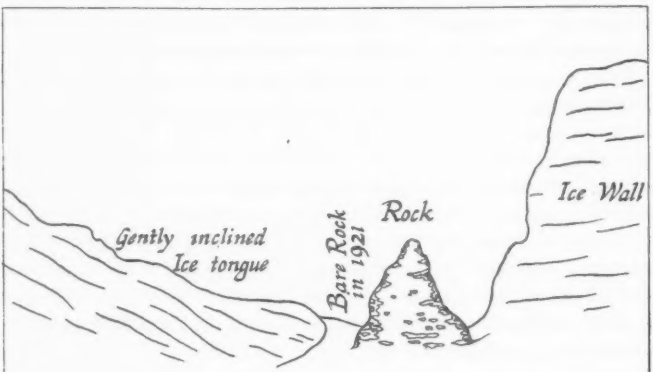
(1) KESTNER, *Zeitsch. f. Biol.*, 73, 1: 1921.
(2) J. BARCROFT, 'The Respiratory Function of the Blood' (1925), Part I. p. 6.
(3) HINGSTON, *The Geographical Journal*, 65, p. 4, January 1925.

NOTE BY MR. C. GILLMAN ON THE ABOVE PAPER

The *topography* is not quite clear, and is made more difficult to grasp by the use of right and left (not in every instance specified by the direction faced) instead of north and south. There are three gaps or notches in the eastern crater rim of Kibo shown on the best and latest map we possess, that based on Dr. Klute's photogrammetric survey of 1912 (reviewed by me in the

Geogr. Journ., 1923, p. 70), and named, from north to south, " Hans Meyer," " Johannes," and " South " Notch (Scharte) respectively.

I reached " Johannes Notch " in 1921, so that Dr. Latham, who on his second day climbed to the rock where I had deposited our records, must have struck the rim at " Johannes Notch " too, his " Leopard Point " (reached on the first day's climb) being obviously identical with " Hans Meyer Notch." The interesting fact is that Klute's " South Notch," of which I had seen no trace from any part of the saddle or of Kibo's eastern slopes in 1921, and which also does not appear on C. v. Salis' diagrammatic sketch of the crater rim accompanying his paper on an ascent in February 1914 (*vide* " Die Alpen," *Journal of the Swiss Alpine Club*, August 1926, p. 284), seems still to be missing. For evidently Dr. Latham proceeded from Johannes Notch to Kaiser Wilhelm Spitze without encountering any further gap in the ice of the crater rim, although his forced *détour* craterwards (page 497, para. 2) may indicate rougher ground where, in 1912, a notch existed. This absence, on



Johannes Notch, Crater of Kibo, Kilimanjaro.

the south-eastern and southern part of the crater rim, of a notch with steep ice walls, like those on either side of Hans Meyer Notch and on the north side of Johannes Notch, also seems to bear out my opinion that the safest, quickest, and least tiring way from the southernmost notch to the summit of K.W.S., lies along the rim and not through the crater.

As to terminology, I dislike the idea of replacing " Johannes Notch " by " Gillman's Point." Neither term is geographically descriptive, and if it is necessary to bring in proper names to designate features which, like the notches of Kibo's ice-cap, are probably only very temporary surface forms, then Major Johannes' priority of more than twenty-five years ought to be respected ; all the more so as his name is already embodied on all existing maps. I think, then, that the name Johannes Notch should stand for the time being, and that if the notch as such disappears the name Johannes Point can be substituted, for the rocky point is at present merely a part of the surface feature comprised in the term " notch," from whose centre it springs up as shown in the sketch. Furthermore, it was on top of this rocky point that I found in

1921, though not Major Johannes' own (which may have been among the no longer decipherable cards), yet the records of his German successors.

The furthest beacon west (or north-west) visited by Dr. Latham (page 498, para. 2) was erected by W. Furtwaengler and S. Koenig, who were the first (and last, thus far, to my knowledge) to have made the ascent of Kibo on ski (vide Norwegian Ski Year-book *Aarbook*, 1921). The same point had also been reached by C. v. Salis and W. v. Ruckteschell in 1914, who, like Dr. Latham, had also at first thought the highest point lay at the far north-west end of the wall, just above the great western gap.

Mavenzi.—I consider it wrong to talk of "moraines" (page 498, para. 4) in connection with Mavenzi, the accumulations of coarse *débris* enveloping the foot of the mountain's rocky walls being undoubtedly, at least at the present morphological stage, scree-slopes and cones.

As to the history of ascents of this minor, though from the climber's point of view very much more attractive, twin-peak of Kilimanjaro, the following seems to be a correct record :

1912, first ascent by F. Klute and Oehler.
1914, W. Furtwaengler and S. Koenig (of the Academic Alpine Club, Munich).
1925, G. Londt.

This refers to the highest point only, other eminences of the craggy rim having been climbed by other parties.

Physiology.—Dr. Latham's very interesting account of the physiological conditions on Kilimanjaro are a most valuable addition to our knowledge. On the whole they bear out my own and Nason's experiences in 1921, chiefly that the personal factor is one that enters very strongly into the calculation. Dr. Latham's complaint of "markedly diminished mentality," however, I cannot endorse, for at 19,500 feet, whilst enjoying a pipe, I felt very alert both from the emotional as from the intellectual point of view, and that in spite of the severe strain and worry caused by the serious state of collapse in which my companion found himself.

I have always maintained that a fresh breeze decreases the effects of rarefied air, whilst calm weather or calm sheltered localities, such as a gully or a leeward slope, aggravate the symptoms of mountain sickness. For it seems clear that in an atmosphere stirred by air-currents more air, *i.e.* more oxygen, must reach the breathing organs per unit of time than in calm air. (This observation had already been made 140 years ago by De Saussure, *vide* Mr. Freshfield's 'Life' of the great Alpine pioneer, p. 198, as also Mr. Freshfield's own experience on Elbruz, *ibid.*, p. 231, footnote.) This dependence on wind may explain the curious fact that on the saddle plateau, *i.e.* at a comparatively low altitude, Dr. Latham and his companion suffered from nausea, and from greater nausea when resting than when moving (page 494, para. 1). It was a bright and, one must assume, a calm day, so that even slow walking may have produced, relatively to the climber, a moderate current of air, whilst during a rest there would be no appreciable air-current.

C. GILLMAN.

West Bridgford,
8th November 1926.

LUBAANTUN

A REPORT upon the archæological investigations made this year into the Maya site of Lubaantun, in Southern British Honduras, has been presented to the trustees of the British Museum, under whose auspices the work was carried out. Lubaantun lies about 55 miles by river from the coastal settlement of Punta Gorda, near the head-waters of the Columbia river, the main affluent of the Rio Grande. The lower reaches of the Rio Grande are navigable, but at about halfway to the junction with the Columbia there is a series of falls. The Columbia at the junction is about 15 yards wide, but it is much obstructed by fallen trees and other "snags." The site is on an abruptly rising hill-spur between two small tributaries, about three-quarters of a mile from the river-bank. The surrounding country is hilly and is covered with dense forest. These facts sufficiently account for the site having remained so long unknown.

In 1903 Dr. T. W. F. Gann visited and described a ruined site on the Columbia river, of which he had heard from some black woodcutters. His report to the Governor of British Honduras is printed in the *Proceedings of the Society of Antiquaries*, vol. **20**, 1903–05, pp. 103–112. He also contributed an account to the *Journal of the Anthropological Institute*, vol. **35**, 1905, pp. 103–112. Dr. Gann, who was accompanied by the District Commissioner, Mr. Phillips, went in April 1903 up the Rio Grande by boat, spending one night on the way. The following day, having reached a point 3 miles beyond the junction with the Columbia, he disembarked and struck inland. "After about 5 miles' walking we struck the Columbia, at what was supposed by former visitors to have been a wharf or landing-stage connected with the ruins." It proved however to be a purely natural formation, found at several other points along the river. Camping for the night 1 mile farther on, he was successful next day in finding the ruins, about 1½ miles from the river.

They were not at first sight so striking as others of the kind, but their size, combined with the absence of minor ornamentation, gradually impressed him strongly. He described the ruins as consisting of two great stone-faced terraces, on which were a number of mounds, also stone-faced. The lower terrace was slightly over 300 yards long and 70 yards in breadth, ranging from 5 to 15 feet in height. In the centre of this was another terrace, with a uniform height of 2½ feet, 100 yards long, and extending right across the main terrace. Upon this were the best-preserved mounds, six in number. The finest of all was 31 yards square and 33 feet high, built in four terraces, each with sloping walls, so that the top was only 24 feet square. It was crowned by a heap of worked stones. The angles were rounded and the surface covered with neatly cut blocks of hard crystalline limestone. The east and north

sides of this mound were perfect: the other two had fallen away, several large trees having taken root between the stones. Three of the other five mounds on this terrace were mere heaps of ruins. Two of these ruined mounds were excavated, without striking results, their centres being filled with quantities of broken red brick of all shapes and sizes. The surface of the lower terrace was also covered with similar mounds, but these without exception were ruinous. In all cases mounds and terraces ran exactly east and west. While digging in the lesser platform he found that to a depth of at least 6 feet the structure was composed of chips of stone, the refuse left by the masons who dressed the stones for the walls and mounds. Dr. Gann also noted the great scarcity of potsherds on the site, which led him to surmise that it was not inhabited but used entirely for religious ceremonies, and that a city might possibly be buried in the bush close at hand. He concluded his report by urging that the ruins should be further explored, that the bush and trees should be cleared away, and that no unauthorized persons should be permitted to excavate near the ruins.

For the next twenty years the site appears to have remained unvisited. True, an American named Merwin is said to have been there about ten years later, but it is not clear that the site upon which he worked was actually that which Dr. Gann had visited, for a characteristic of the Lubaantun area is the absence of ornamental carving in stone, while it is reported that Mr. Merwin removed carved altars from his site. Nor indeed is it absolutely certain that the site afterwards called Lubaantun is identical with that visited by Dr. Gann in 1903. The country is full of ruined buildings deeply embedded in forest and bush, and is at present unsurveyed. However, in 1923 Dr. Gann was in Belize endeavouring to obtain a concession for excavating the ruins he had found twenty years previously. Here he met Lady Richmond Brown and Mr. F. A. Mitchell Hedges, who asked for a joint concession, and a combined expedition was arranged. This was merely a reconnaissance to rediscover the 1903 site. On the first attempt to reach it the party met with several accidents, and had to return to Punta Gorda to reorganize. Finally, however, they reached the ruined site near the Columbia, which has since been worked for two seasons, and to which a Maya name, Lubaantun, "fallen stones," has been given. Little clearing of the bush was done until the following year. The work then done showed that an important Maya site had been discovered. In spite of the difficulties of getting an adqeuate supply of labourers locally, by the end of the second season the greater part had been sufficiently cleared of bush to allow photographs to be taken. Older structures beneath the stone-faced terraces were revealed, which with other evidence pointed to three separate periods of occupation. Quantities of figurines, stone implements, and other artefacts were also brought to light. The investigators also discovered that this site, called by Dr. Gann "the

citadel," was not the sole relic of Maya civilization in the neighbourhood. Beyond the creek to the west of the " citadel " were other buildings of a similar character, 300 feet above the valley bottom, and, to the west again, beyond another stream, more ruins on still higher ground, dominating the surrounding country. This area was covered with dense virgin bush and trees often 250 feet high, so that it was impossible to do more than to cut trails to the various sites and to examine them cursorily. Indian hunters also reported other ruins farther into the bush, hitherto unvisited by Europeans. The greater part of this information on the work of 1923–1925 is taken from Dr. Gann's book ' Mystery Cities. Exploration and Adventure in Lubaantun,' which was reviewed in the *Journal*, 67, p. 265.

Early in the present year the party again returned to Lubaantun, with Mr. T. A. Joyce, of the British Museum. From his report to the Trustees a more comprehensive idea of the site, and its significance for the history of Maya civilization, may be obtained. The summit of the hill spur had in ancient times been levelled, and various buildings of cut stone blocks, including pyramids and mounds enclosing courts, built upon it. These courts were the scenes of religious ceremonies. The hillside had been carved into terraces, also stone faced, which rise about 50 feet above the stream. The length of the group of ruins, running almost due north and south, is approximately 900 feet; the breadth towards the northern end is about 500 feet. The two principal pyramids rise about 40 feet above the summit. The site is therefore one of the largest yet discovered in the Maya area.

The preliminary investigations carried out this spring show that beneath the final structure lie several periods of construction, which carry the date of its foundation back to the beginnings of Maya civilization. Four definite architectural styles were noted. Perhaps the earliest was perpendicular building with well-cut and matched blocks, regularly " set back " every few courses; the second, " in-and-out " building, in which every other course projects beyond that below it, the outline showing a distinct batter; the third, obviously late additions composed of badly cut and ill-matched blocks. The fourth style is the most interesting, but without further excavation its chronological sequence cannot be determined. On the eastern slopes, terraces were laid bare which were built of blocks " which can only be described as megalithic," some measuring over 5 feet long by 2 feet high by 4 feet deep. Their position suggests that they underrun the two large pyramids in the " in-and-out " style, and therefore are earlier in date. It is probable that they are even earlier than the perpendicular style. Though common in Peru, masonry of this character had not been discovered in the Maya area. The succession and character of styles, the evidence of frequent reconstruction, and the large supplies of labour these imply, suggest that further investigations may prove Lubaantun to be one of the earliest centres of

Looking north from centre of ruins: Pyramid E on right

South-east corner of Mound F built in perpendicular style, with outer skin of later masonry on left

Photographs by Mr. T. A. Joyce.

Southern portion of Lubaantun from hill to eastward. Pyramid C forty feet high to right, and collapsed hill terraces

Native village of Columbia near the ruins on opposite bank of river

organized culture in Central America. The pottery and other objects found during the excavations further support this suggestion. Pottery of the style previously classed as " Early Maya " has been found in the surface layers, so that further excavation may be expected to throw important light upon the development of Maya art and culture. Especially characteristic of the area are fragments of plaques and figurines, each furnished with a whistle behind. The absence of carving, and therefore of inscriptions, makes it impossible to date the various structures, but they are believed to have been continuously occupied from an early date till after the Spanish conquest.* Summing up the results, the Report states that " in Southern British Honduras there appear to exist remains of a branch of Maya culture exhibiting certain entirely new characteristics. Many of the structures are obviously of great age, and promise highly important evidence bearing on the past of America if they are studied systematically." Mr. Joyce's report to the Trustees concludes by paying a tribute to the pioneer work of Dr. Gann, Lady Richmond Brown, and Mr. Mitchell Hedges in opening up this important site. In the near future an exhibition of the stone and pottery finds from Lubaantun, with photographs, will be arranged at the British Museum.

We understand that the Government of British Honduras are anxious that the British Museum should assume responsibility for the further development of research on this and the many other Maya sites in the Colony : and that Dr. Gann, Mr. Mitchell Hedges, and Lady Richmond Brown are for their part equally anxious that the prosecution of the study should be undertaken under expert direction and on a scale larger than is possible by private enterprise. It seems eminently desirable that the fruits of Dr. Gann's early discovery, and of the energetic and costly operations of Mr. Mitchell Hedges and Lady Richmond Brown, should not be lost to the British Empire for want of public support and national interest. We shall hope to hear, therefore, before long that the evident desire of the British Museum to pursue this investigation will receive the enlightened support of the Government and the munificent assistance of private benefactors. An essential preliminary, in which this Society should be especially interested, is a reconnaissance survey of the whole Colony, which, though it has been definitely under British control for over a century, and a separate Crown Colony for sixty-five years, is almost entirely unmapped.

* It should not be forgotten, however, that Fernando Cortes passed through the south of this area on his journey across the peninsula from Mexico to the Gulf of Honduras in 1524–25, and in his Fifth Letter to the Emperor Charles V. he gives a graphic description of the hardships endured and the difficulties encountered in traversing such country. None of the places named by Cortes during this stage can now be identified with any certainty, but Mr. Maudslay (Introduction to ' The Conquest of New Spain,' vol. 5, Hakluyt Society, Series II. vol. 40) thinks it clear that the Spaniards on this expedition met with no traces of the higher Maya civilization, which would have been impossible had the cities still been flourishing.

THE ARABIAN DESERT

Through Unknown Arabia.— Major R. E. Cheesman, O.B.E. London: Macmillan & Co., Ltd., 1926. 10 × 7, pp. xx + 433. *Maps and Illustrations.* 25*s. net.*

ARABIA DESERTA is happy at all events in its historians. Comparatively few books have been written on its history and geography, but these few are distinguished by qualities which are too often sadly lacking in the flood of books that have appeared in recent years on Palestine, Syria, Iraq, and Persia. Niebuhr, Palgrave, Doughty, Hogarth, Philby, and Harrison, to quote a few examples, have each written on Arabia from very different angles, but their books have a quality of their own. Major Cheesman's book deserves to rank with them. As remarked by Lord Curzon in his classic work on Persia, Great Britain appears to have been unpardonably slack in the past in promoting scientific inquiries in Persia generally and especially in the Persian Gulf region. Instead of making use of our position and of the unequalled resources of the topographical and geological survey Departments of the Government of India to make a thorough examination of the hinterland on both coasts, we have left this task for the most part to chance travellers and Government officials, with the result that great areas were, until the end of the Great War, almost as unknown to us as they were to Nearchus. The marine and terrestrial fauna and flora and the geology of this region had never been systematically studied as they should have been by the highly competent experts in the employ of the Government of India, as the agent of the British Government in these parts.

The researches conducted during the past few years have largely removed this reproach so far as Nejd is concerned. Very full studies of the geology of Muscat and Oman, of the Trucial Coast, Qatar, Bahrain, and Kuwait, have recently been made by Mr. G. M. Lees, M.C., D.F.C., of the Anglo-Persian Oil Company, Ltd., and by other geologists. A flood of light was thrown on the geography as well as the politics of Nejd by Mr. Philby's work published in 1922, and now Major Cheesman has carried research a step further, and on more scientific lines than any of his predecessors, with results that cannot but be gratifying to all who seek to enlarge the bounds of human knowledge, and in particular to those who seek to narrow the limits of " unknown Arabia."

Whilst primarily concerned with zoology, a science to which this book is a notable contribution, Major Cheesman had, as at Uqair, an eye for archæology, and few are likely to dispute his contention that the site of the ancient trading mart of Gerra is to be found there. He has added something also to our knowledge of the geology of the region, and his botanical observations, though they follow in general the lines of Mr. P. A. Buxton's notable work ' Animal Life in Deserts,' are of great interest. The Arab realizes better than most people the complete ultimate dependence both of man and beast on the plant world. In the ultimate resort the botany of a district determines the nature of animal life therein and consequently that of its human denizens, and deserves much more attention than it has hitherto received.

Major Cheesman's appreciation of Ibn Saud himself is both just and, in the light of subsequent events, prophetic; his observations on the Sultan's subjects are shrewd and kindly, though in matters linguistic and ethnological he is clearly less well equipped than in other directions.

The principal interest of the book, however, to members of this Society lies in his account of his journey southward from Hofuf to Jabrin, over some 150 miles of absolutely unknown desert country. Throughout the length of

this journey he took careful astronomical observations, with the result that we may regard the position of the oasis of Jabrin as settled for practical purposes. Beyond it, another 150 miles south, the wells of Magainma beckon. The name has never been heard of before by European travellers, and seems to have little resemblance to any Arabic word, though Mr. Philby's suggestion ('Near East,' October 28) of Umm Ghanaimah is worth consideration. He mentions its possible connection with the Magan or Maganna of the Sumerian inscriptions, but does not refer to the fact that Fraser Hunter's map of 1908, which embodies the meticulous inquiries of the late Mr. J. G. Lorimer, I.C.S., shows in the bight of the Trucial Coast, south of Qatar, a district called Mijan. It is to be hoped that Major Cheesman, than whom no one is better qualified for the task, will sometime essay to reach Magairma on the very edge, if not in the heart, of the empty quarter, though he does not himself admit the applicability of this term to the great South Desert.

Major Cheesman has cast his net wide, and his observations on a multitude of subjects, from the fishes which live in water of the temperature of a hot bath in isolated oases, to the prevalence of malaria in Jabrin despite the absence of anopheles, though the place is uninhabited for the greater part of the year, and is literally hundreds of miles from the nearest water or human habitation, are stimulating and challenge further research. On one department of human knowledge that might be expected to come within his scope, however, he is notably silent. Of palæolithic or neolithic man he seems to have found no trace whatever, though it is not to be supposed that he was not on the look-out for flint weapons or similar evidence. Neolithic encampments have been definitely located within the last few years in the Hamad, east of Amman, and in Mesopotamia, at Susa in Elam, and possibly at Bushire, where Pezard found "eneolithic" remains, but nothing of the sort has hitherto come to light from Muscat or from Oman, from the Trucial Coast, or Nejd, and we can only hope that subsequent travellers, by an examination of caves such as those referred to by Major Cheesman on pp. 94 and 352 (Jabal Qara), will discover traces of early man.

Proverbs xxv. ascribes to Solomon the remark that "The honour of kings is to search out a matter," and in this respect Major Cheesman has proved a worthy representative of His Majesty; and those readers who, like the present reviewer, have had many opportunities of travel, but have not equipped themselves as carefully for the task as has Major Cheesman, will replace the book on their shelves with a feeling of regret that every Government official whose privilege it is to travel at the public expense in these regions is not required to equip himself with at least a modicum of scientific knowledge, for it is clear that the mind which is thoughtful rather than receptive or imaginative, which studies phenomena be they in mental philosophy, in politics, or in natural science, with a view to elucidate and establish the true relations that exist among these phenomena, is the type of the mind in which the logical faculty of investigation is well trained, and if one thing has emerged more clearly than another in the last few years, it is that the method of investigation, rather than the method of authority when applied to the problems of the East, gives the desired results. Knowledge must precede science, but must be homogeneous with pre-existing knowledge. The facts of political as of natural science must reach continuously down and rest on a sure foundation. The authors mentioned at the commencement of this review have given us a glimpse of the foundations of Arabia from several angles. The abiding merit of Major Cheesman's book is that he also has contributed something to our knowledge of fundamental facts.

A. T. W.

REVIEWS

EUROPE

Finland To-day.— Sir Frank Fox, O.B.E. London: A. & C. Black, Ltd. 1926. 9 × 6, pp. x. + 182. *Twenty-three Illustrations and a Map.* 6*s.* 6*d. net.*

THIS lively and interesting account of Finland is particularly welcome at the present time, not only because Finland is attracting increasing numbers of British travellers, but also because of her outpost position as one of the geographical barriers between Bolshevism and Western Europe. Sir Frank Fox does not pretend to have written a standard work; he offers, as he candidly states, no more than a traveller's impressions, reinforced by historical and economic facts. But Sir Frank is an experienced traveller and, what is more, an experienced writer of this kind of book. He has a wide knowledge of men and affairs, a quick sympathy with the people of whom he writes, and an instinct for selecting exactly the information that will interest his readers most.

After a brief historical sketch, he devotes a chapter to Helsingfors. He then describes the country's agriculture, forests and manufacturers, and gives an account of her administration, finance, and social conditions. His last chapter he calls "Finland for the Tourist." Presuming that an intending visitor has only a month to spare, he counsels him to travel to Finland by the direct sea route, from Hull to Helsingfors, and to return by steamer from Helsingfors to Stockholm and thence to London *viâ* Copenhagen. The three weeks that remain over from the journey he suggests dividing thus: a week in Helsingfors and its environs; a week at Hango beach; and a week at Punkaharju for the lake scenery and the rapids. He has some useful notes on railways and hotels, gives some sound advice to intending fishermen, and points out that although Finland has not attracted many winter tourists as yet, there is never any lack of smooth ice and of snow for winter sports; while he rightly maintains that for yachtsmen it would be difficult to exaggerate the charm of the Finnish archipelagoes, whose waters are still almost unknown to the cruising yachts from Western and Southern Europe.

Altogether, this will prove a most useful book for any one in search of information about modern Finland. It is well illustrated, and is provided with an index and an adequate map. O. R.

Czechoslovakia: The Land of an Unconquerable Ideal.— Jessie Mothersole. London: John Lane, The Bodley Head, Limited. 1926. 9½ × 6, pp. xxiv. + 296. *Sixty Illustrations by the Author in Colour and Black and White, and a Map.* 18*s. net.*

Invited by a firm of publishers to select a European country to describe, Miss Mothersole chose Czechoslovakia, and set about her task with a conscientiousness that is wholly admirable. "I think," said President Masaryk's daughter, on hearing that the authoress meant to take at least two years over it, "it is going to be an honest book." And certainly the greatest pains have been taken to enter into the spirit of Czechoslovakia and to give a faithful portrayal of the land and its people.

Miss Mothersole began by making a careful study of the history, without which no country can be properly appreciated; and the first third of the book is devoted to a lucid summary of events from the early legends to the Declaration of Independence in 1918, followed by a sympathetic account of the young republic and the relations of the Czechs to the German minority on the one hand and to the Slovak Clericals on the other. But she has done a greater

thing than that in learning the Czech and Slovak languages, difficult enough with a knowledge of Russian to help you, but far more formidable if they are the first Slavonic tongues to be tackled. With this equipment and a liberal supply of introductions, she was able to enter into the lives of the people and to win their confidence with the happiest results.

For Miss Mothersole sees everything with the eye of an artist, and can put what she sees on paper with considerable skill. Many a time did she persuade the wearer of a picturesque dress to "sit" to her; and the coloured plates (printed in Czechoslovakia, by the way), besides being charming in themselves, constitute a valuable record of the local costumes. Many readers will want to take the next train to visit that remarkable Slovak village of Čičmany, where the women wear nothing but white garments delicately embroidered in various reds and yellows; or the Ruthenian town of Jasiňa, where the men's attire appears to be a riot of colour. Indeed, the only objection to the book is that it may send a horde of tourists to these delectable spots with the inevitable result of sophisticating the inhabitants. It is impossible not to sympathize with the peasants of a certain Ruthenian village, who, feeling instinctively that their peace of mind and body would be ruined, dug a large pit to stop the approach of a motor road. The Hungarians, in keeping their Slav subjects in as backward a condition as possible, as least protected them from some of the horrors of Western "civilization" and left them to their potteries and their embroideries, even though they may have taken the credit of these to themselves. Incidentally, it appears that the "Hungarian" compositions of Liszt and Brahms were probably inspired by Slovak music. However, with the removal of Magyar domination and with the assistance of Czech teachers education has recently made phenomenal strides in Slovakia, and we must devoutly hope that the Slovaks will not lose that simplicity and picturesqueness which are so attractively presented to us in Miss Mothersole's words and drawings. J. H. R.

Macedonia, Thrace, and Illyria: Their Relations to Greece from the earliest times down to the time of Philip, son of Amyntas.— Stanley Casson. Oxford University Press. 1926. 9 × 6, pp. xx. + 358. *Illustrations and Maps.* 21*s. net.*

Mr. Casson has expanded what was originally an essay into a book, covering, in subject, at least three specialized branches of learning, in time, a period of 2500 years, and in space, a vast and complicated area. In so wide a field unevenness is almost inevitable.

With regard to the topographical part of the book, while it is perhaps too much to expect that the author should have visited personally the whole area, it is a pity that the principle of αὐτοψία, on which he rightly insists, could not have been applied more fully to Illyria. In his rather hasty sketch of its geographical conditions we miss, especially for the interior, those first-hand touches which make the description of much of Macedonia and Thrace illuminating. A description, for instance, by one who had traversed it, of the route from Sarajevo to the Western Morava valley (a route of which the rail-heads on either side of the mountain range have recently been connected), and a discussion of its feasibility, would have been interesting in view of a possible theory of direct intercourse between Bosnia and Macedonia in prehistoric times: also of the Cetinje–Podgorica–Peć route, of which the eastern half was opened for wheeled traffic last year. Similarly, a fuller treatment of S.W. Macedonia would have been welcome. Two mounds on the Haliakmon

from which surface finds supply important evidence for early relations between Thessaly and Macedonia, as also the group of funeral tumuli near Ekaterini, are not mentioned. A personal visit to Chalcidice would have revealed the fact that the mounds extend eastward into the Ormylia valley, where there are two, in addition to the site of Sermyle. Even in those parts of Macedonia with which he is familiar, closer *αὐτοψία* would have saved the author mistakes. On p. 124, for instance, after chiding Rey for admitting a type of "Toumba-sur-table" into his classification of mounds, Mr. Casson cites the great mound of Vardarovtsa as the "most notable example" of a new category, which he (Mr. Casson) calls Type III. b, or "prehistoric mounds of double type." In point of fact, Vardarovtsa is nothing of the kind. It is a prehistoric Toumba of his Type III. a, round which later settlements have formed flat-topped mounds or "tables" of Type II. In other words, Rey's category of "Toumbas-sur-tables" is perfectly sound, and Vardarovtsa is a good example of one.

Again, the account of the ascent of Mount Pangæon (pp. 63–66) is unsatisfactory. In the first place, the map (p. 64) is upside-down. The monastery is rightly described as being on the northern side (p. 63), but the path, we are told, passes over the "south-eastern roots" of the mountain. A rapid scanning, even with the strongest binoculars, of an extensive mountain like Pangæon, with all its folds and wooded hollows, has no value as a means of determining the presence of ancient workings: and it is difficult to see how Mr. Casson can have made an exhaustive examination of the summit in the time at his disposal. Pangæon, like Olympus, has at least four peaks which vary little in altitude, and of which any one might pass as the summit, before the days of surveying (the actual summit of Olympus has been determined only within the last few years). As these peaks are some distance apart, it would require a day in itself to examine them thoroughly, quite apart from the ascent and descent of the mountain.

It is inaccurate to say (p. 100) that "the Vardar winds are always dry." They are frequently accompanied by snow or icy sleet, as the reviewer knows to his cost.

With regard to the part dealing with the prehistoric period, it is a pity that the evidence from the recent excavations of the British School was not available when the book was written. In the light of them, Mr. Casson would no doubt have modified his views as to the date of the appearance in Macedonia of the spiral-meander pottery in the Bronze Age, and of pottery of the Chauchitsa type in the Iron Age, which he has placed respectively too early and too late. The latter, too, is now shown to be, in all probability, not that of the northern invaders (with whom an earlier stratum containing fluted pottery of markedly Danubian type should be associated), but preponderatingly native.

Mr. Casson minimizes Mycenæan influence in Macedonia, and has misrepresented the Vardino results which bear on this question. The abundant Mycenæan pottery found both at Vardino and Vardarovtsa was nearly all made locally, not imported.

It is surprising to find the name of Rey omitted in the Introduction from the list of pioneers in Macedonia.

In spite of blemishes, the parts dealing with topography and prehistory are, on the whole, extremely good. The chapter on natural resources and grouping of cities and the summary of archæological results in Illyria are particularly well done. Every student of the Balkans owes Mr. Casson a profound debt of gratitude for the laborious accumulation and often brilliant interpretation of all this widely scattered material.

The parts dealing with the archæology of the historical period and with the historical period itself are outside the scope of this veview. W. A. H.

ASIA

British Malaya.— **L. A. Mills,** with Appendix by **C. O. Blagden.** (*Journal Royal Asiatic Society*, Malayan Branch. Vol. 3, Part 3. 1925. Pp. 338.)

Before turning to the text of this very interesting and useful summary of the history of British Malaya we may remark that the absence of a map is a great drawback. Even to one familiar with the region it would have been an acceptable addition, whilst those lacking that advantage must perforce sit with an atlas open on their knees! This criticism over, nothing but praise remains for this very succinct and clear account of our enterprises in the Malayan islands, and for the wealth of references to original authorities.

Few people realize the size of some of these islands. Wallace remarks that in Borneo, " the whole of the British Isles might be set down and would be surrounded by a sea of forests."

Although the Dutch are now the largest proprietors in this region, for a time we tried to dispute their supremacy. Our earliest ventures—those of Lancaster (1591) and Middleton (1604)—were mere explorers' voyages. On the other hand, the Dutch came out with the deliberate intention of ousting the hated Spaniard and securing the spice trade, in which they had long played the part of middlemen to the Portuguese. By 1599 they had secured their position. Their first step was to raise the price of pepper from three to eight shillings a pound. This apparently trivial act on the part of the Dutch had most important consequences for us. It forced the English merchants to assert their independence by forming the East India Company, and thus in the end led to the foundation of our Empire in India.

The Dutch Company, supported by its Government (we are ever reluctant to give such aid!), finally drove us from the field and, but for the perseverance of two men, we might have retired wholly from Malaysia. But in 1786 Francis Light, a young ex-navy officer, induced our Government to make Penang a naval base. It rapidly grew in prosperity, but was afterwards found to be unsuitable for its original purpose, as docks could not be constructed there, and was abandoned in 1812. A new base was therefore needed, and once more the necessary man came to the front in Sir Stamford Raffles. As Mr. Mills says, " Had it not been for his determined disobedience of orders, in all human probability the Malay Peninsula to-day would be a Dutch colony."

An Assistant-Secretary in 1808, he persuaded the British Government to keep Malacca. By 1810 he had risen to be Agent for the Malay States, and one year later Lieut.-Governor of Java. In 1819 he interviewed Lord Hastings, then Governor-General of India, and brought him round to his views on the need for thwarting Dutch designs. Losing no time, he sailed for Singapore, anchoring off that place on 6 February 1819.

Singapore prospered by leaps and bounds, the population rising from 5000 in June 1819 to 12,000 in 1820; and by 1821 it was paying its own way. Raffles left in 1823 and died, unremembered, in 1826. But Singapore remains to vindicate his action. Until 1867 this region was under the control of the Governor-General of India, when it was, most wisely, separated from that administration.

A condensed account in a Journal such as this cannot be expected to touch on the romantic side of Malayan history. Still, if we read between the lines, we can recover something of the human touch in the work of Light and Raffles,

that touch which lies at the base of all romance. There is no little romance even in Raffles' dictum: "While we are here let us do as much good as we can." Has it not ever been our boasted watchword in dealing with alien nations of the East?

For those who want Malayan history in picturesque guise there is Overbeck's excellent translation of the 'Hikayat Hang Tuah,' a genuine Malayan work; and for a delightful account of Malaya in these days the reader may be referred to Mr. R. J. H. Sidney's 'Malay Land.' We are much indebted to Mr. Mills for so adequately dispelling that general ignorance of Malaya to which Mr. Sidney refers. C. E. L.

The Economic Position of Persia.— Moustafa Khan Fateh. London: P. S. King & Son. 1926. 8½ × 5½, pp. 98. 6*s. net.*

The author's preface to this volume, which is a survey of the economic conditions in Persia at the present, suggests that there are two reasons for the book meriting attention: that it is written by a Persian, who is "more entitled to know about his country than Europeans who have based their information merely on a short visit to the country"; and secondly, that it is, so far as he knows, the first attempt to treat this subject in the English language. To these we would add a third reason, namely, the clearness and orderliness of the presentation. The volume discusses in turn the agricultural and mineral resources of the country, the particular problems of the agricultural, oil-mining, and the manufacturing industries, and the general conditions of finance and trade. It concludes with a forecast as to the future economic development. Judging from this chapter the author is fairly optimistic, asserting that the political obstacles of the past have disappeared, there is security and comparatively sound public finance, and the country is on the brink of a modern stage with great potentialities. What are needed are an increase of population and additional capital. With reference to the first, the writer urges a policy of immigration, estimating the present population at 10 million (other estimates include those of 12 million and 15 million (1914)). As regards the provision of capital, there are, apparently, already projects in hand to organize taxation so as to raise the money with which to pay interest on loans. The most immediate demand for this capital is for the development of transport: "Persia must either have railways at once or disappear from an economic point of view" (p. 63). B. H.

The Orient I found.— Thomas J. McMahon. London: Gerald Duckworth & Co., Ltd. 1926. 9 × 6, pp. 223. *Sixty-one Illustrations and a Map.* 15*s. net.*

Mr. Thomas J. McMahon is an Australian, and although his book is written for the general public, he stresses what he terms "an Australian viewpoint of Oriental conditions." As he rightly observes, whatever influence Oriental nations may attain in the future, Australia will be a prime factor in the consideration of the problems that arise. Sooner or later the "White Australia" policy will be challenged by Oriental peoples, and he is of opinion that if racial equality is to be discussed without aggressiveness, much present harshness will be softened by a fuller knowledge of these peoples. With the laudable object of helping his readers to this fuller knowledge Mr. McMahon has written this book, which is a record of impressions gained during a trip to the Far East, in the course of which he visited North Borneo, Manila, Japan, and China.

Mr. McMahon is satisfied that he has "gained much useful and reliable information," which he offers in the present work. He is perhaps a little too easily satisfied. At times his information is not only unreliable but definitely incorrect: for example, it is not correct to state that the presence of a sentry before the State Bank (inaccurately called the Bank of Borneo) at Sandakan is "necessitated by raids of pirates on the bank at various times." The Bank has never been raided. Nor is it correct to state that the opium "dens" in Sandakan are not licensed. It is to be feared that Mr. McMahon is too prone to accept statements without verifying them; moreover, it is doubtful whether much of his information, even when reliable, is likely to prove particularly useful, since most of the facts he gives about China and Japan are easily obtainable elsewhere. His experience of the Far East appears to be too superficial for his conclusions to have much value, and he underrates the intelligence of his readers when he descends to such platitudes as "foreign enterprise has done much to advance the trade and prosperity of China." The most interesting things in the book are the illustrations, which are excellent and well reproduced. O. R.

AFRICA

The Voyage of the "Dayspring."— Being the Journal of the late **Sir John Hawley Glover, R.N., G.C.M.G.**, together with some account of the expedition up the Niger River in 1857, by **A. C. G. Hastings.** With an Introduction by **Lady Glover.** London: John Lane, The Bodley Head, Ltd. 1926. 9 × 6. Pp. xiii. + 230. *Illustrations.* 12*s.* 6*d. net.*

It was not till the return of Barth from the Western Sudan in the middle of last century that the vast resources of the interior of West Africa began to be appreciated. In 1857 the Government, at the instance of this Society, sent out an expedition in the little *Dayspring* under Dr. Baikie to explore the lower Niger up to Busa and to get into touch with the powerful Fulani sultan of Sokoto. Lieut. John Glover, who already had much distinguished service to his credit, was selected by the Admiralty to undertake the river survey. By his energy and courage he soon became the leading spirit of the expedition.

The voyage up the Niger past the confluence of the Benue was uneventful, and Glover accomplished valuable work in charting the river. Disaster overtook the expedition at Jebba, where the *Dayspring* was wrecked on the famous Ju-Ju Rock. The Europeans, already very sick with fever and now rendered nearly destitute, were forced to camp on the shore to recuperate. Glover, who was in no better health than the rest, but hated inactivity, determined to reach Busa. He set out with one companion, and after a journey of considerable peril, in which ill health and the hostility of the natives were his greatest difficulties, he achieved his object. After a short stay at Busa he returned to the camp at Jebba, and was able to report that he had established friendly relations with all the tribes he had visited. He found his companions in a state of exhaustion, anxiously awaiting the arrival of the relief ship, which was long overdue. It was decided to abandon the project of visiting Sokoto, but Glover resolved to pay one more visit to Busa. On the way he recovered Park's book of logarithms, which is now in the Society's museum. Having completed his chart of the Niger from the sea to the Busa rapids, he rejoined his companions, who were now quite destitute. Fortunately the relief ship arrived very soon afterwards, and the expedition returned to England. The results of the expedition were disappointing on the whole, but Glover had done much valuable work. Throughout he had displayed the great qualities which afterwards made him a much-loved administrator.

Glover's Journal, which is composed of letters written home, is full of interest and gives a vivid description of the appalling conditions which then prevailed in West Africa. In placing it in the able hands of Mr. A. C. G. Hastings, Lady Glover made a most happy choice. More than half the book is his own work. His long and varied service in Africa has provided him with a wealth of interesting experiences to draw upon, and his discursive style is always agreeable. He tells several good stories, and has much that is interesting to say, especially about Mungo Park and his death at Busa.

It is to be regretted that the same type has been used for the Journal as for Mr. Hastings' work. As the two alternate with each other throughout the book, it is often difficult for the reader to remember which author he is reading. The proofs, too, might have been corrected more carefully. And why has a delightful little book—and this book above all others—been marred by the deplorable omission of a map? E. W. B.

Impressions. Nigeria, 1925.— Douglas C. Fraser. London: Herbert Jenkins, Ltd. 1926. 9 × 6. Pp. 188. *Sketch-map and Illustrations.* 10*s.* 6*d. net.*

Mr. Fraser travelled from Sapele to the Benue and thence to Kaduna, from which place he returned to Lagos, much of the journey being performed by rail. Big-game shooting was his object, but the country is difficult for a beginner, and the results of his expedition do not seem to have been commensurate with the expense and trouble involved.

The "impressions" which Mr. Fraser gathered during his brief visit are not very flattering to Nigeria. He was certainly unfortunate in some of his experiences with natives, but so deplorable is his whole attitude towards the African that it is difficult not to sympathize with those who took advantage of his inexperience. Indeed, much of the book might be regarded as dangerous were it not assured an early obscurity. E. W. B.

AMERICA

Heirs of the Incas.— Carroll K. Michener. London: Methuen & Co. 1926. 7½ × 5, pp. 213. *Twelve Illustrations.* 7*s.* 6*d. net.*

Portions of the chapters in this volume have, it is stated, appeared in the *Dearborn Independent* and the *International Interpreter*, to both of which periodicals the contributions were probably suited. Despite the author's information that "dust assailed us fetidly," his assurance that he saw the "mummy" of Pizarro in Lima, that at church festivals in Bolivia there is a "large consumption of *chicka*," and such patent errors as the telescoping of two respectable Spanish captains, Juan and Ulloa, into one person, the book is pleasant, brightly written, and has interest as the record of an appreciative traveller upon beaten paths. L. E. E.

Acoma, the Sky City.— Mrs. William B. Sedgwick. Cambridge (Mass.): Harvard University Press; London: Humphrey Milford. 1926. 8½ × 5½, pp. x. + 314. *Illustrations.* 18*s.* 6*d. net.*

Mrs. Sedgwick has, in the present volume, done her best to give a faithful picture of conditions in the rock city of Acoma, in New Mexico, perhaps the most picturesque of all the aboriginal pueblos which have for so many centuries remained in their primitive state of culture, secluded upon the mesas of this part of North America. Although Acoma itself is difficult of access, and hostile to travellers, the author has done her best to shed all possible light upon the customs and beliefs of this ancient group. The book is delightfully presented,

and forms a valuable addition to the literature upon the people of the pueblos. Photographs of this region are invariably charming, and those utilized by Mrs. Sedgwick are no exception to the rule. L. E. E.

Florida.— Kenneth L. Roberts. New York and London: Harper & Brothers. 1926. 8½ × 5, pp. xiv. + 324. *Illustrations.* 8*s.* 6*d. net.*

The 324 pages of this book are entirely devoted to "real estate" propaganda, and appear to be reprints of newspaper advertisements. Such force as they may originally have had must have been sensibly diminished by the recent disasters in Florida. L. E. E.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

The Tide.— H. A. Marmer. New York: D. Appleton & Co. 1926. 8 × 5, pp. ix. + 282. *Illustrations.* 10*s.* 6*d. net.*

To the average man who wants to know something about tidal phenomena and their causes, this book will undoubtedly make a strong appeal. It offers a simple, lucid, and well-arranged exposition of a very complicated subject, presupposing no special knowledge on its readers' part and eschewing mathematical reasoning as far as possible. It is, in the best sense of the expression, a popularly written text-book. Although planned upon a strictly practical basis and dealing chiefly with methods and results of observation, as opposed to questions of theory, it embodies, subject to this restriction, a surprisingly complete summary of the evolution and present state of tidal knowledge in all its branches.

There is, however, one feature of the book which will probably strike its non-American readers as a somewhat pronounced defect. Being written by an official of the tidal branch of the U.S. Coast and Geodetic Survey, its facts and examples, together with its accounts of prediction methods and machines, etc., naturally relate chiefly to American data and American productions. In such circumstances, to give a preference to accessible material is almost inevitable. But in the present case the material has been presented in so exclusively and almost aggressively national a spirit that the reader is, if not actually informed, at least led to infer, that in all matters of tidal research—the development of tidal theory, the collection of observations, the evolution of prediction methods, and the design and construction of predicting machines, gauges, current-meters, etc.—America leads, and has always led, the rest of the world. So consistently is this idea—which, it is hardly necessary to say, is very far indeed from the truth—inculcated that it could scarcely have been further emphasized if such portions of the book as relate to non-American tidal research had been totally omitted—in fact, such a course would really have been fairer to all concerned, since the reader could then hardly have failed to appreciate that he was being asked to absorb a certain amount of propaganda in the guise of information. If the author had shown himself a little more ready to give credit where credit is due, he would have greatly improved an otherwise admirable and informative treatise.

The book is very cleanly printed, and contains a number of excellent photographs and diagrams. R. T. G.

Geological Maps.— Robert M. Chalmers. Oxford: University Press; London: Humphrey Milford. 1926. 8 × 5½, pp. 175. *Diagrammatic Maps and Sections.* 12*s.* 6*d. net.*

This is a useful guide to the interpretation of geological maps, whether for academic or practical mining purposes. The first five chapters are devoted

to topographical maps. In the next seven, forming the bulk of the book, stratified rocks are dealt with, the interpretation of maps in terms of dip and strike, folds, faults, thrust-planes and unconformities, the determination of thickness, and the graphic completion of outcrops, being all treated in a practical manner with numerous examples and clear illustrations. The special features of igneous rocks and certain broad questions, such as Isostasy, occupy the rest of the book.

In chap. ii., a list of the British Ordnance map-scales is given (but no statement is made as to those of other countries). This includes the two 1/M sheets, but it is not explained that these are parts of the International map, nor that they are bounded by meridians and parallels—an omission the more surprising as some space is devoted in chap. iii. to the variation of the vertical margins of ordinary Ordnance sheets from true North-South. On p. 91 the most unfortunate term " strike of the outcrops " is introduced, which is certain to confuse a student and is quite unjustifiable : " direction of outcrop " is correct and clear. An unfortunate comma on p. 90 divides Mr. E. B. Bailey into two persons. A. M. D.

HUMAN AND HISTORICAL GEOGRAPHY

Business Geography.— Ellsworth Huntington and **Frank E. Williams.** New York : John Wiley & Sons. London : Chapman & Hall, Ltd. Second edition. 1926. Pp. xvi. + 616. 13*s.* 6*d. net.*

The value of this now well-known work has been enormously enhanced by the extensions and improvements of this new edition. The first edition, which was reviewed on p. 462 of vol. **61** of this *Journal*, has had 134 pp. added to the text, and the improvements both in the text and the tables are numerous and various. The extensions are mainly in the first half of the work, which is so changed as to be virtually new. Throughout the book the former pictorial illustrations have been suppressed, and their place is taken by a greatly increased number of maps and diagrams. Of these there are 155 in the present edition as compared with 97 illustrations of all kinds in the first.

The principal extension is a new chapter entitled " Combined Effect of Soil and Relief," a chapter of great interest, including eighteen small distribution maps of the state of Alabama, for the purport of which we must refer our readers to the book. The tables in Part V. have been brought up to date where necessary. Some have been provided with additional columns, and most of those giving statistics as to the separate states of the United States now give similar information as to the provinces of Canada. There are now three indexes—to the text, the illustrations, and the tables respectively.

But notwithstanding all that may be said in praise of this new edition it must still be added, as was done in the notice of the first edition, that " it should be read critically." This applies specially to some of the new maps and tables. The authors seem to have been misled by an excess of subtlety to try to show more in tabular or map form than can be so shown with any significance. Take, for example, the World Map of Productivity per Capita (p. 13), for which the claim is made that " it sums up the main facts of Business Geography better than does anything else yet available." It is difficult to see what the unit at the basis of this map really stands for. We are told that it is a value unit, the figures on the map stating in dollars per head of population in rough approximation the annual production of the agricultural, fishing, and lumbering population when all commodities are reckoned in American prices. Those prices, we are told elsewhere (p. 11) are either the average price at the farm,

mine, or other point of production in the United States or, in the case of articles not produced in the United States, the import price at New York. Let us consider how this method applies to a single commodity. The value of any commodity is the ratio of exchange of that commodity with any other commodity (but usually money) at a given place and time. But by the method indicated the proviso as to place at least is neglected. No true value enters into the calculation, but an arbitrarily chosen average. The total amount of the commodity thus estimated will vary according to the quantity, and thus it is really quantities and not values that are measured. When we are dealing with a single commodity that does not matter. Whether values or quantities are used the variations will be the same. Clearly the expression in values has been adopted only to arrive at a formal total for a diversity of articles. But this total is merely formal, the supposed unit standing for something of no significance in relation to "the task in business geography," in the language of the top of p. 12. Consider, for instance, concrete facts in relation to two commodities for which data are given in Table A, pp. 9–10, oats and milk. The "value" is the average of the values on the different farms of the United States, but the fact of business significance is the utility to the consumer, which is measured (at least relatively to the place and time) in the price at the place of consumption. There can be no absolute measure of utility. But a very large proportion of the oats is consumed on the farm, and for this part of the consumption it is not practicable to estimate any addition for the cost of reaching the consumer. For milk, on the other hand, in a country with a population distributed like that of the United States (still more in a country like Great Britain) enormous additions must be made under this head. To reinforce this consideration let us look at facts given in other tables. From Tables 1 (pp. 515–7) and 13 (pp. 543–5) in Part V. we get the figures in the first two lines of the table below, from which may be calculated those in the last line :

	England and Wales.	*United States.*	*Sweden.*
Population in thousands	37,886	110,664	5988
Millions of gallons of milk produced annually	1,350	8,700	1025
Gallons of milk per head	35·6	78·6	171·2

From these figures it is manifest which of the three countries is most likely to have its inhabitants adequately supplied with milk.

Then in connection with this matter further difficulties arise in consulting other parts of the book. On p. 84 we are given one reason why New Zealand stands at the top of productivity. This position for New Zealand is based on the figure (1059) given for its productivity on the map which we are now considering. But in another table (11, pp. 528–31) we have other figures for productivity arrived at by another method, and in this table New Zealand with the productivity there given (155) does not stand at the top, but is surpassed by Denmark, the United Kingdom, Germany, the Netherlands, Switzerland, and Belgium, for which last the figure 204 is given. As to New Zealand, it may be pointed out that the method adopted for the map must give it too high a place in productivity if that productivity is thought of in relation to its purchasing power on the world market. Its remoteness, a point on which the authors insist, must make its actual values much lower than the supposed values based on American prices. G. G. C.

The Oil Industry.— Ernest Raymond Lilley. London: Constable & Co., Ltd. 1926. $9\frac{1}{4} \times 6$, pp. 548. *Maps, Photographs, and Diagrams.* 31*s.* 6*d. net.*

The economic importance of mineral oil, so much in demand in all civilized countries and so unequally distributed through the world, has led to the growth of a considerable body of literature, both periodicals and books. The subject has so many aspects that no two books are likely to treat it in exactly the same way, however much they may repeat one another on the fundamental facts. The present work gives comparatively little space to the geological side of the subject, though enough to give the general reader some idea of the problems that face the oil geologist. Much more attention is given to details of drilling, transport, refining, and marketing methods. There are very good accounts of the geographical distribution of mineral oil and of oil-shales, and of the history of the industry from the middle of the nineteenth century to the present time. The last chapter discusses the probable future of the industry. If the exhaustion of the world's coal supply be a remote prospect it is otherwise with oil, the practical exhaustion of which may possibly come within the lifetime of the younger of us. Professor Lilley thinks that in twenty years' time oil-shale may have begun to replace mineral oil for the production of gasoline.

The book is well printed and the maps and diagrams well reproduced. The half-tone photographs are not all equally good, some being rather foggy; but perhaps the American student has an eagle eye not possessed by the present reviewer, and can carry out the injunction, given below a distant photograph of a gusher, to "note the sand which has been brought up with the oil." A misprint of *New Guiana* for *New Guinea* (p. 478) has escaped the Errata; and the term "isovol," used in Figs. 4 and 5, does not seem to be explained and is not found in the index. A. M. D.

THE MONTHLY RECORD

EUROPE

Glacial Observations in the French Alps.

In vol. 5 (1925) of the *Etudes Glaciologiques*, issued by the Service des Forces Hydrauliques of the French Ministry of Agriculture, we have a new series of observations of the glaciers of the French Alps in the decade ended 1920, put together by M. P. Mougin. It includes a vast amount of detailed work which will be invaluable for future study, but of which only a few salient points can be mentioned here. The continuity of the observations was naturally broken to some extent by the War, but every effort was made to keep up the more important, especially in the Massif of Mont Blanc, whose glaciers have been longest studied and present the greatest interest. The first chapter, occupying 66 pages out of a total of 224, presents the details of the observations for each glacier in turn under the three headings of variation in length, variation of level, and variation in the extent of the terminal snout, the whole profusely illustrated by diagrams and illustrations. Particularly careful were the observations of the Tré-la-Tête glacier between 1908 and 1913, largely under the direction of Prof. C. Bernard; but they were interrupted during the War. However, a reconnaissance made by M. Bernard in 1920 has permitted fairly accurate conclusions as to the changes which had taken place in the course of the preceding decade. No summary of results is given in this chapter,

and it requires a somewhat careful search to find certain general conclusions at the end of the second chapter, which deals with the questions of alimentation and melting. There, in two short and inconspicuous paragraphs, we are told that during the period in question there has been a general increase of the ice in the Mont Blanc Massif and the inner chains of Savoy—an increase most marked in glaciers of steep gradient (Le Tour, Argentière, Les Bossons); whilst in glaciers of the Alpine type, with but a moderate general gradient, it is at present seen only in the form of a rise in the surface-level (Mer de Glace, Tré-la-Tête, Gébroulaz), the effect not having yet reached the lower end. Conditions are different in the glaciers of the Franco–Italian frontier, subject to the influence of winds from the Po valley. These show either a but slight increase (sources of the Arc), or are even in marked retreat (sources of the Isère and Arnès). In this second chapter special attention is given to the observations of snowfall and its variation both with altitude and from year to year. It is shown that the principal periods of advance since the early nineteenth century have all been preceded by periods of abnormal precipitation. In the third chapter an attempt is made to determine the sub-glacial contours of the Mer de Glace, and in the fourth such subjects as the variations of speed of flow according to the stage of advance or retreat and according to season (the movement being found generally most rapid in summer) are discussed. The last chapter deals with avalanches, glacier-bursts, and glacial erosion. In regard to the last, M. Mougin adopts a cautious attitude, holding that the question is still an open one, though he quotes M. J. Vallot, apparently with approval, to the effect that the erosive action of glaciers is but slight. An attempt is being made to obtain definite evidence by means of holes drilled in rock surfaces about to be covered by an advance of the ice, the depth of each hole being exactly determined.

A Thermal Continentality Map of Germany.

In view of the discussion in the *Journal* (July 1924) of the maps produced by Spitaler and Swoboda showing for the world and Europe the distribution of thermal continentality and oceanity on the basis of mean annual range of temperature (*Petermanns Mitteilungen*, June 1922), it is of interest to draw attention to a continentality map of Germany on the same basis produced by Dr. Hans Schrepfer by a somewhat different method due to Zenker (*Petermanns Mitteilungen*, 21 Jahrg., 1925, 3/4 Heft). Like Spitaler, Zenker some forty years ago did a great deal of work, though on rather different lines, relating to the mean temperature of parallels of latitude and of hypothetical land and water hemispheres (Hann's *Handbuch der Klimatologie*, I. Bd.), but his more immediate process of deriving coefficients expressing the degree of thermal continentality is a good deal simpler. First of all, he makes the crude annual ranges of temperature at various places between January and July comparable by reducing them to a percentage scale by a method which involves a correction for latitude, under the assumption that the mean annual range is inversely proportional to the cosine of the latitude. The reduced range at each place, called the "relative range," is then expressed on a continentality or oceanity scale by using the ratio (1 : 6) between the smallest relative range over the heart of the oceans and the greatest over the middle of the continents, and from these values the lines of equal continentality are drawn across the map. No correction is made for altitude, since it is not absolute height above sea-level that affects the annual range of temperature, but height in relation to surrounding configuration which is taken as part of the continentality effect—isolated

peaks and ridges having a smaller range of temperature than cups and plateaux at the same height above sea-level.

Without entering into the philosophy of Zenker's method which, like Spitaler's, is open to criticism, it is obvious that Zenker's scale is purely relative, leaving no room for super- and sub-continentality values, above and below 100 and 0, and thus lacking the more absolute significance of Spitaler's scale which gives the latter its value. The consequences of Zenker's compressed scale is at once apparent when Schrepfer's map after Zenker is compared with Spitaler's map. In Schrepfer's map Germany lies between 15 per cent. continentality in the west and 30 per cent. in the east, in Spitaler's between 35 per cent. and 50 per cent. respectively, and the latter figures are certainly in better keeping with practical experience of the German climate. There is much to be said for placing an abnormal region like North-East Siberia (Spitaler 130 per cent., Zenker 100 per cent.) in a class by itself, so that the values for ordinary climates are not unduly lowered by competition. The figure of 27 per cent. assigned by Spitaler to Cambridgeshire, for example, gives a fairly suitable expression for a country which while sharing the general oceanic character of England as a whole has a distinct continental tendency. But had Schrepfer's work been extended to the British Isles we should have found Eastern England with something like 10 per cent., the value shown on Spitaler's map along the monotonously equable west coast of Ireland, and there would be much less room to distinguish instructively between different parts of these islands.

It is somewhat singular that Schrepfer makes no reference to Spitaler's maps published only three years previously in the same periodical.

A Canal for Northern Italy.

A paper was read before the International Exhibition of Inland Navigation and Utilization of Hydraulic Power at Basle this summer on a project for a great North Italian canal. This suggested "pedemonte" canal is to link Milan and the industrial areas of the Po valley with Venice and the Adriatic. For various reasons, including the extent to which it experiences "brouillards" and the length and deviousness of its routes, it has been decided not to canalize the Po system. The exact route of the canal has not yet been determined, but it would at least link together Turin, Novara, Milan, Mantua, Verona, and Venice. It is also expected that the Italian lakes could be brought into the system. One of the aims is to give Italy an increased share and control of Central European traffic—to reply, in fact, to what are referred to as the attempts to "smother" Genoa as a great European port. It is claimed that, as compared with the Marseille–Rhône–Rhine route, it would reduce the journey to Central Europe by 400 kms. It seems doubtful, however, whether the cost and delay of transferring from the canal to the Swiss railways would not considerably decrease this benefit. Its value to Italian industry however is not overrated. It is pointed out that the direction of the railways show that the traffic is pedemont: these lines, now sometimes congested, would also be relieved by the canal. Few actual details are given, but a company has been formed in Milan to acquire powers for its construction, which it is stated could be done in five years.

ASIA

A Scientific Trip in Southern Palestine.

In spite of the work of scientific travellers like Dr. Max Blanckenhorn (see *Journal*, **42**, p. 386), not to mention his many predecessors, the geology

and physical geography of Palestine still offer a field for research, and a beginning in this direction has been made by the Chemical Institute of the Hebrew University in Jerusalem. The still imperfectly known "South Country" was chosen as the scene of the first attempt, a trip being made in that direction (in what year is not stated) by Messrs. Reifenberg, Bernfeld, and Picard, the last acting as geologist to the party. The time was limited and the trip is regarded as merely a preliminary reconnaissance, but the account written by Mr. Reifenberg (accompanied by a geological report by Mr. Picard) adds something to our knowledge and corrects statements by Blanckenhorn in one or two particulars ('Publns. on the Scientific Investn. of Palestine,' I.—Jerusalem, 1926). Besides the geology, attention was given to the chemical composition of rocks, soils, and waters, as also to the bituminous deposits and the possible occurrence of petroleum. Among the rocks examined were the salty dolomitic limestone already described by Sachsse, which always remains moist owing to its hygroscopic character. Its marked salt-content led Blanckenhorn and Sachsse to suppose that rock salt existed at no great depth, but Mr. Reifenberg prefers to assign the salt to æolian origin. An analysis of soil of the white alkali type in the neighbourhood of the Dead Sea also showed a very high salt content, enough to make it completely sterile in one case. A visit was paid to certain pitch-wells in the Wadi Muhawat to which the Badawin apply the name Bir Chumr, in which the writer sees a survival of the "Beeroth Chemar" in the valley of Siddim associated in Genesis with the destruction of Sodom and Gomorrah. No traces of asphalt were seen in these shafts, but a high temperature was noticeable, and the site, which lies near a fault marked by the sudden change from dark Turonian to light marly strata, seems to have been the scene of a former eruption from the Earth's interior. Near Kurnub some small springs with a nauseous taste, associated with evil-smelling loam and sand, were examined, both water and sand being found to yield a bituminous oil, suggesting that petroleum might be found lower down. A microscopic examination of the loess of the neighbourhood of Beersheba showed it to be made up almost entirely of the finest quartz particles evidently derived from the sandy desert to the south. During the journey various remains of Roman and Byzantine age were examined and photographed, and the paper is illustrated with views of these and subjects of geological interest.

The Journey of Gabet and Huc to Lhasa.

It has become so usual to speak of "Huc and Gabet" by reason of the assured place taken by Huc's 'Souvenirs d'un Voyage' as a classic in the literature of travel, that we are apt to forget that Gabet was not only the senior of the two missionaries but the leader of the venture into the Tibetan wilds. That we would do well to reverse the popular practice is suggested by Prof. Paul Pelliot in an interesting article on the journey in *T'oung Pao*, vol. **24**, 1925–26, pp. 133–178. Although elicited by the recent publication at Peking of a new edition of the 'Souvenirs,' ably edited by M. Planchet (a Lazarist missionary like the travellers), the article is much more than a review of this book, for it discusses fully the many puzzles suggested by a study of the narrative, on which no one is so competent as Prof. Pelliot to pronounce. At one time even the fact of the visit to Lhasa was questioned, but this point has long been settled in their favour. But though Huc's inimitable work may give a correct general impression of the countries traversed, it would be risky to trust it in matters of detail, even when they refer to the author himself. His dates especially are constantly incorrect, and he seems even to have been a year out consistently when he speaks of his first arrival in China. Even his several

published works do not agree among themselves. Fortunately they are not the only sources of original information on the journey, but various letters and reports of Gabet, as well as letters of Huc himself, can be used as a check, most of them printed either in the *Annales de la Congrégation de la Mission* or the *Annales de la Propagation de la Foi*. The 'Souvenirs' were evidently written, during Huc's stay at Macao after the completion of the journey, on the basis (1) of the traveller's notes (not kept with any great care, it is to be feared); (2) his memory; and (3) his study of published works. One of the principal questions calling for solution is that of the way in which the journey came to be undertaken; and though Huc seeks to give the impression that it was a long-entertained plan of his own, it is clear that it was the outcome of fortuitous circumstances, and not conceived in advance even by the superiors of the Mission. Another fact that emerges is that many incidents in which Huc poses as an actual observer were really derived from accounts given him by Gabet and others. The book was in fact written for the public, with which an appearance of first-hand description would no doubt go down best, and though nothing was actually invented the material was re-arranged to suit the taste of this public. The general impression conveyed is however none the less accurate. As Prof. Pelliot remarks, one would like to know what Gabet thought of it all.

An Italian Fund for the Study of Palestine.

We have received from Sir Filippo De Filippi the following account of a new and important project.

The Italian National Committee for Geography has decided to promote the creation of a fund for studies in Palestine, which will be devoted mainly to geographical research, whereas the scope of similar institutions which have existed for many years in other countries has been mainly historical and archæological. In accordance with this purpose, the first work to be undertaken by the Italian fund will be an expedition to chart the Dead Sea on a fairly large scale and to map the adjoining portion of the depression in which it lies and of the Jordan trough. In addition to the hydrography and mapping a geological survey and various limnological researches will be carried out. It is also planned to establish a station on the Dead Sea shores for protracted observation of variations in the sea-level and of the meteorological conditions of the basin.

Besides the field work, the Italian fund hopes to create a centre in Jerusalem provided with a good library and a collection of maps which will be open to all students of palestinian questions.

The institution will also publish memoirs of the Holy Land, with special regard to the old cartography, of which many valuable documents are preserved in the Italian libraries and archives.

The elaboration of the plan, the collection of private contributions to finance the fund, and the organization of the expedition to the Dead Sea have been entrusted to a committee of geographers and scholars, presided over by Cav. Filippo De Filippi, K.C.I.E. The expedition has the sanction of the British Government and of the Governments of Palestine and Transjordania, and is expected to start early in November next year.

AMERICA

Agriculture in Central America.

The conditions and resources of agriculture in Central America are examined by Mr. H. H. Bennett in the *Annals* of the Association of American

Geographers, 14 June 1926. After allowing for the factors of topography and climate, an important part is played by the character of the soil. The topography of the peninsula though very rugged has no great altitude, and the soil, through qualities that make it highly resistant to erosion, thus enables a larger proportion of the area to be brought under cultivation. Over large tracts the bulk of the soil consists of extremely fine particles of a colloidal nature, free from sand. This soil is found up to 6000 feet, and steep slopes show no signs of washing out or gullies. It has been formed by the disintegration to a considerable depth of the rocks by the heavy precipitation. (The mean rainfall for Sarapique is 209 inches.) When especially well drained, this soil has the unusual property of possessing as good organic matter in the sub-soil as on the surface. Such areas are found in the Central Costa Rica highlands and in Salvador. Mr. Bennett is of the opinion that soil deterioration has not taken place to an appreciable extent, and therefore incidentally cannot be accountable for the decline of Maya civilization. The agriculture is classed under four heads: specialized farming, general farming, live stock, and "patch farming." The latter consists in little more than roughly clearing a patch in the forests, planting, and leaving the rest to chance.

Specialized farming, largely the work of American companies, includes the growing of bananas, cacao, coffee, and sugar. The banana plantations are found on well-drained soil on the humid bottoms and deltas of the rivers entering the Atlantic. In drier areas they are grown by irrigation. Little cultivation is required, beyond actually clearing the forest and keeping down the undergrowth. The area under bananas for export is about 230,000 acres, 75 per cent. of which are controlled by the larger American companies. The ravages of the "Panama" disease are driving growers to higher altitudes where lower-grade fruit is produced, and former banana plantations are coming under cacao. The beans are less perishable than bananas, and their cultivation is spreading. Coffee, grown in the highlands at an average altitude of 4000 feet, flourishes in the deep friable soils derived from volcanic ash. Within limits, its quality is said to vary with the elevation, and its quantity with the soil, though the yield also depends largely upon the regularity of the rainfall. About 300 million pounds, the bulk of which is exported, is produced annually. It is of interest to note that in 1913, of the export of Costa Rica, 82 per cent. went to the United Kingdom and 6 per cent. to the United States, while in 1923 the figures were 59 per cent. and 34 per cent. respectively. Sugar is grown on the west coast mainly in the drier areas, especially on the broad coastal plain of Western Guatemala. General farming includes wheat, raised under many conditions and approaching 50 bushels per acre in the better areas, rice, usually grown without irrigation, and tropical fruits. Cattle are raised on introduced grasses in the humid regions, to which they are to some extent confined by the scarcity of fodder in the dry seasons elsewhere. There is much land of value still to be developed in Central America, but the main obstacles are the labour supply, lack of roads and railways, the necessity for measures against mosquitoes, and political considerations.

GENERAL

A New Find of Mercator Maps.

Prof. R. Almagià, whose discovery in Rome of a copy of Mercator's big map of the British Isles (only the second known) was recorded in the *Journal* in 1923 (vol. 62, pp. 33, 138), has followed this up by finding, in the Biblioteca Civica at Perugia, another set of rare maps by the same master, including one

item of quite unusual interest in the long-lost map of Palestine, first published in 1537, and therefore the earliest important work of its author. It has hitherto been known only from incidental literary references. The set consists of four maps or groups of maps, bound together in vellum, the volume probably dating back to the original nucleus of the library, formed by the gift of the sixteenth-century humanist Prospero Podiani. The maps are as follows: (A) the large map of Europe, second edition, 1572; (B) the Palestine map of 1537; (C) maps of the 17 Provinces of the Netherlands; (D) the British Isles of 1564. All are composed of separately printed sheets, but each is accompanied by a cover-sheet with engraved title. (Five such covers, it will be remembered, are still preserved in the Rome Library where the previous find was made, but four of them are now empty.) These title-pages or frontispieces evidently did service for various maps. Thus the Europe in the present set has the framework originally engraved for the maps of the "17 provinces," but the title in this case is given on a circular label pasted in the centre. On the third page of the cover of maps A, B, and D there are directions for mounting the sheets to form complete maps, this method of sending out large maps in sheets having been adopted for greater ease of despatch to foreign countries.

While the Europe (first issued in 1554) is in 15 sheets, the Palestine occupies six only; it turns out to be an historical map, made to illustrate the Bible story, and extends from the Nile delta to Mount Hermon. Prof. Almagià has paid special attention to the watermarks of the paper used, and says that all correspond either to No. 95 or No. 96 of the marks figured in this *Journal* for May 1924, those two examples being in fact based on tracings kindly sent by the professor in 1923 from the sheets found in Rome. Once more therefore we have to do with a set probably issued about the same time (*c.* 1570–80 ?), so that the Palestine is a fairly late reprint from the original plate. The maps of the 17 provinces, of which the frontispiece only (of this issue) had previously been known, prove to be not sheets of a single large map but identical with the special sheets subsequently included in the Atlas of 1585. The first issue was probably made in connection with the "Pacification of Ghent" of 1576, annulled in 1579. It seems that at least one of Mercator's large maps has yet to be discovered—one, moreover, likely to arouse special interest as representing America in 15 sheets, and therefore presumably on quite a large scale. That such a map was issued is shown both by the Plantijn Press Records and by the fact that two of the existing frontispieces show the title "America" beneath the slips pasted on to fit them for others of the series. All the Perugia copies are in excellent preservation, and the Palestine is shortly to be reproduced in facsimile.

Madras Geographical Association.

We have received from the newly formed Madras Geographical Association a copy of the first number of its *Bulletin*. The Association itself only came into existence early in 1925, with the object of promoting geographical studies in Southern India, and research into the geography of that region. The *Bulletin* contains a report of the Inaugural Meeting of the Association, at which Dr. J. H. Cousins delivered an address upon the place of geography in education, and also a strong plea for the establishment of a School of Geography at the University of Madras. The subscription to the *Bulletin* has been fixed at 12*s.* 6*d.* for foreign subscribers; communications should be addressed to The Secretary, The Madras Geographical Association, Y.M.C.A., Vepery, Madras. It is greatly to be hoped that this effort to improve the position of geographica studies in India will meet with success.

Gilchrist Studentship.

The Gilchrist Trustees again offer, for 1927–1928, a Geography Studentship of £80, tenable at any recognized school of geography, with a view to the furtherance of improved teaching of geography in schools. Applicants, who should be teachers with at least two years' experience, should send in their names to Prof. L. W. Lyde, University College, Gower Street, W.C.1, from whom further particulars may be obtained, before 31 January 1927. They must give references and a full account of their previous work, and their applications should be accompanied by three testimonials.

OBITUARY

The Rev. W. A. B. Coolidge

THE Rev. William Augustus Brevoort Coolidge, the distinguished Alpinist and author, who died on May 8 last, had been a Fellow of our Society from 1890 to 1913. Born in 1850 near New York, he came early in life to France, and then to Switzerland, in search of health. He was accompanied thither by his aunt, Miss Brevoort, who shared with her nephew the love of mountains, an inheritance from an earlier generation, and who took part in many of his earlier ascents. In 1869 Coolidge went up to Oxford, where he remained until 1896, first as a member of Exeter College, and later as a Fellow of Magdalen College and curate of South Hinksey. This was the period of his great ascents in the Alps, too numerous to be detailed here. His climbs in 1871, for instance, included the Dent Blanche, Matterhorn, Wetterhorn, Jungfrau, and Eiger. Three years later, with his aunt, he made the first winter ascent of the Wetterhorn and Jungfrau. Few parts of the Alps remained unvisited. His health beginning to decline, he left Oxford in 1896 for Grindelwald, where he lived until his death. The change, however, produced no marked results; his last ascent was made in 1898, and he perforce turned his energies entirely to the congenial study of Alpine topography and history. In accuracy and extent his knowledge in these fields was unrivalled. His most important work was 'Josias Simler et les origines de l'Alpinisme jusqu'en 1600,' published in 1904, and awarded a medal of the Société de Géographie of Paris. This work was based upon Simler's treatise, 'De Alpibus,' of 1574, but it contained a mass of detail on the early literature and history of mountaineering, peaks and passes, and other kindred subjects. Coolidge also issued from time to time volumes of collected sketches, edited various Alpine classics, compiled handbooks to the Alps, and more technical guides for climbers, besides contributing to many periodicals. For ten years he was also the editor of the *Journal* of the Alpine Club, of which he had become a member in 1870, and an honorary member in 1904. If his works, through their exceeding profusion of detail, do not appeal to a wide circle of readers, they will, for that reason among others, remain invaluable to the student of Alpine topography and history.

George William Lamplugh, F.R.S.

George William Lamplugh, whose death took place on October 9, was an eminent geologist and a geographer of note. A life spent in geological field-work and in studying the effects of atmospheric erosion, especially of ice-action, enabled him to interpret the future of a landscape and to invade with more success than most that borderland between the sciences where the geologist seeks to explain the land-forms recorded by the geographer.

Born at Driffield on 8 April 1859, he was educated at private schools; but when thirteen years old moved to Bridlington, where the grand coast sections roused a natural bent for geology. He had commenced a commercial career, but, deliberately discarding the financial possibilities, decided to spend his life in scientific research. He became a professional geologist, as a member of the staff of the Geological Survey, in 1892.

He had before this made his mark. For several years he had occupied his spare time in recording the ever-changing exhibitions of the glacial deposits in the Yorkshire cliffs. His first paper appeared when he was nineteen, and in it he boldly took a view, not generally held at the time, that the marine shells contained in the drifts were no proof of submergence, but were as truly boulders as the stones with which they were mingled. He detected also relics of a fresh-water deposit, drawn out into lenticles in the boulder clay, but still containing an abundance of a freshwater shell. He inferred that the Bridlington drift had been formed by the accumulating power of a huge mass of ice, moving at one time over a soft sea bottom, at another over the silty bed of a pond, and pushing before it an increasing mass of sand and shells. At the same time he was engaged in an examination of the Specton series of strata and a comparison of it with the Scalby series of Lincolnshire. This work later on was incorporated in a joint paper with Professor Pavlov of Moscow, and became of European significance.

When he joined the staff of the Geological Survey he had already proved his capability, and was at once entrusted with the geological surveying of the Isle of Man. He carried out the task in five years, dealing in a masterly manner with a mass of problems in every branch of geology, including physiography of unusual interest. His memoir on the island takes rank as a classic in modern geology. In 1901 he was placed in charge of the Irish branch of the Survey, and remained in Dublin until that branch was transferred to an Irish Department in 1905. He then took charge of the Midland and North Wales districts, and later on was engaged in the Wealden area until 1914, when he was appointed Assistant Director for England and Wales, a post which he held until his retirement in 1920. During the latter part of his official career he was engaged in collecting the records of the boreholes that were being put down in the south-east of England in search of coal. The records were unintelligible until they were interpreted by him and the fossils dealt with by his colleague, Dr. Kitchin.

Lamplugh missed none of the few opportunities he had of travelling. He visited the Eastern and Central States of North America, Vancouver, and Alaska, and southwards as far as New Orleans. He also visited the Grand Cañon of the Colorado and Spitsbergen, and attended British Association excursions to Vancouver, South Africa, and Australia. The excursion in South Africa was undertaken at the request of the Council of the British Association, the object being an examination of the falls and gorge of the Zambezi from a geological and physiographical point of view. The chasms into which the river plunges had been popularly supposed to be due to a rending of the Earth's crust. Molyneux, in the *Geographical Journal* in 1905, showed that they were the work of normal erosion. Lamplugh was able to confirm this, and to trace the formation of the chasms, gorges, and zig-zags to the action of torrents of water picking out joints and fractures in the rock. He wrote a paper on the subject in this *Journal* in 1908.

Lamplugh became a Fellow of the Geographical Society in 1905, and served on the Council in 1912–15. He was a frequent attendant at the afternoon

meetings, and often brought his wide experiences and ripe judgment to bear on the subject under discussion. He was elected to the Geological Society in 1890, served on the Council several times, and was President in 1918–20. He was made a Fellow of the Royal Society in 1905, and served on the Council in 1914–16. He was President of Section C of the British Association in 1906, Past-President of the Yorkshire Naturalists' Union, of the Hull Geological Society, and of the Hertfordshire Natural History Society, and honorary member of several other societies. He received from the Geological Society a part of the Lyell Fund in 1891, the Bigsby Medal in 1901, and the Society's highest honour, the Woollaston Medal, in 1925. A. S.

CORRESPONDENCE

Ukhaidir

THE sympathetic and interesting obituary notice of Gertrude Lowthian Bell in the October number of the *Journal* contains a serious mistake. It was not "one of the German excavators of Babylon" but a French archæologist, M. Massignon, who anticipated by so short a time her examination of the palace of Ukhaidir, as will be found by referring to her own note on the subject in 'Amurath to Amurath,' p. 148.

H. DEVONSHIRE.

Maadi, Egypt,
22 October 1926.

[I am grateful for this correction of my confusion of the German excavators, who anticipated a *second* visit of Miss Bell's to Ukhaidir in 1911, with M. Massignon, who anticipated her *first* visit. I take this opportunity to correct another mistake of mine. Miss Bell took her First Class at Oxford in 1888, not 1887.—D. G. H.]

"Jhuming"

Mr. Mills will no doubt reply himself to Lieut.-Col. Pottinger's letter on "Jhuming" in the September number of the *Journal*, but I think it can hardly be the case that the system is attributable to a soil too poor to produce yearly crops.

The explanation given to Lieut.-Col. Pottinger that the soil becomes choked with weeds, rendering it easier to prepare a new piece of ground than to clean the old piece, is certainly correct, but it does not go the whole way. I have seen it demonstrated in "Jhums" on the borders of which I have lived for several years, that where the hillside is at all steep, if the weeds and grasses are eradicated in the second year, a soil wash from the heavy rains commences when the binding effect of the weed-roots has disappeared. This soon becomes so formidable that the top soil is carried down to the streams.

Where the soil is contour-terraced as by the Angami Nagas, in the middle of a "Jhuming" country, it proves itself very far from being poor.

The Mikirs of Assam maintain that fifteen years is the optimum period between jhums; but in actual practice the length of time depends on the pressure of population and on the area of land abandoned for "Jhuming" owing to the depredations of tigers. Mikirs will not readily "jhum" an area again in which a village headman has been killed, even where land is scarce.

Yours faithfully,

H. S. L. DEWAR.

New Tining, Catcott, Somerset,
10 October 1926.

I have read with interest Col. Pottinger's remarks on "Jhuming." He remarks that "he has not met with it in the hills between Assam and Bhutan." I may state that it is practised among almost all the hill tribes of the Frontier of Assam. The Lushais, Mishmis, Abors, Galong Abors, and Dufflas.

The Lushais, as Col. Pottinger states, carry out the idea of "rotation" in Jhuming. Their main object however is to convert the forest to bamboo jungle, as easy to fell and easy to burn after being jhumed, and I have seen whole hillsides of bamboo jungle in consequence.

The Abors in British territory confine themselves to rotation, but I believe those outside British influence have been so wasteful in their methods that land is growing scarce and economic pressure is driving them down into the borders of British rule. Hillsides once clothed in jungle are now bare wastes of weeds in Abor country.

I think I may say that Jhuming is practised everywhere in the more uncivilized hill tracts of Assam.

As the hill people become educated to less wasteful methods they begin to turn to the idea of "wet" rice cultivation, largely practised by the Angami Nagas of Assam as described by Dr. Hutton. Demonstrators of this method were sent up to the Abor Hills to teach, but with poor results.

H. I. HALLIDAY.

Laminhuri P.O., N. E. Frontier, Assam.
2 October 1926.

With reference to Col. Pottinger's letter in the September number of the *Geographical Journal*, the system of "Jhuming" or "Taungya" cultivation extends over a very much wider area than that mentioned by him.

It extends throughout the whole length of Burma down into the Malay Peninsula and as far east as Annam.

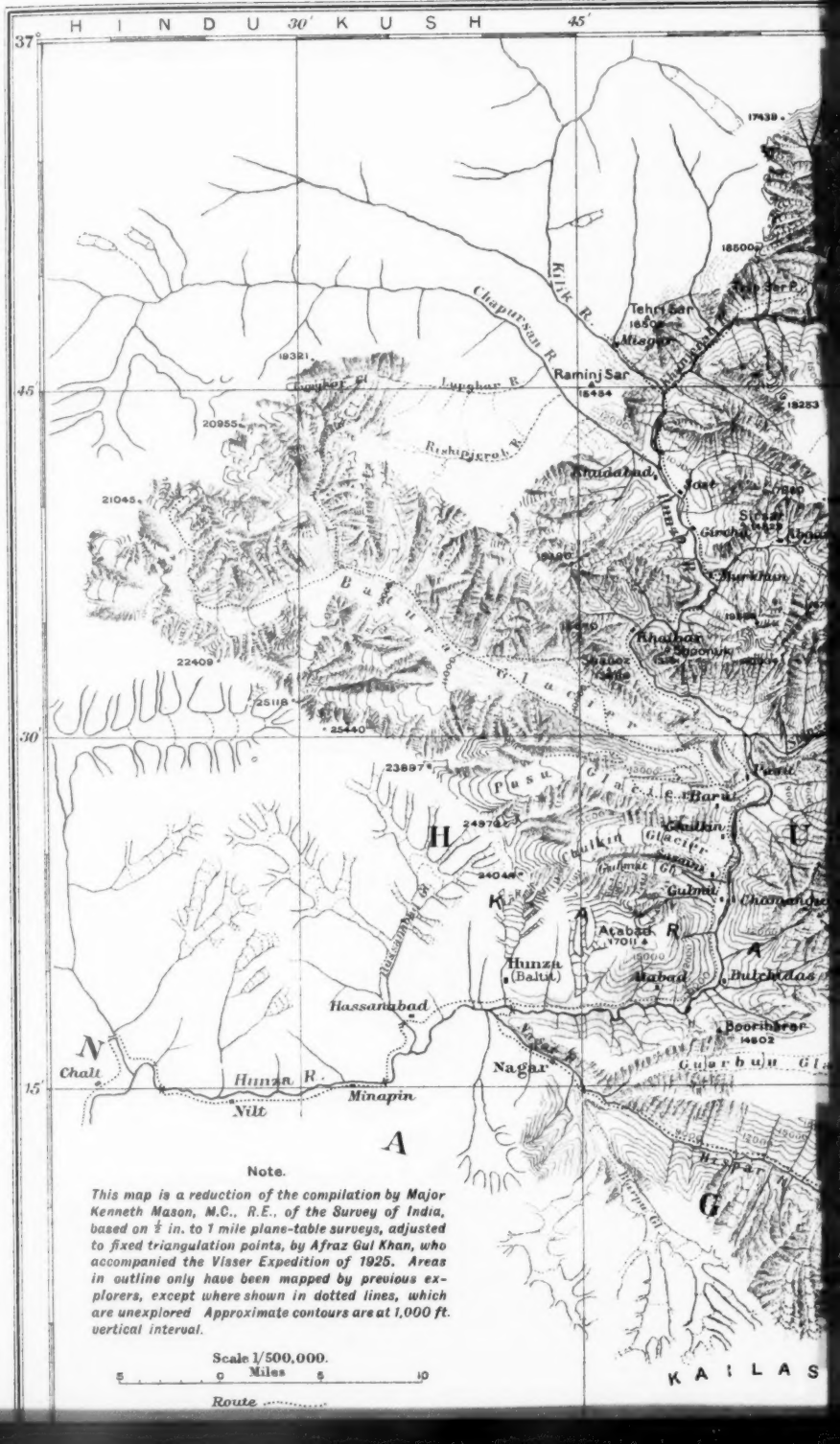
With regard to the Shan States, the subject has been discussed in the August and September numbers of the *Indian Forester* for 1913. The developments in the Shan States of this system of cultivation are extremely interesting as they exhibit all stages from the purely migratory methods of the Lahū (Mühsö) in Trans-Salween territory, through the almost scientifically regulated rotations of the Padaung and Bre in Bawlake and Möng Pai states, up to the permanent settled methods of the Taungthu and Taungyo in the Myelat, which have become a system of open field cultivation with a long fallow period.

While the growth of weeds as the reason for the abandonment of the land after taking one or two crops is undoubtedly correct for many areas, the need of manure in the shape of wood ash and the aeration and flocculation of the soil by the actual burning which necessitate the accumulation of a woody crop to burn are equally important reasons.

So well is "taungya" cultivation in Burma established as an agricultural system that it has been adopted there and elsewhere as one of the most useful methods of forming forest plantations by following the lines of the German method of Wald-Feldbau.

W. A. ROBERTSON,
Indian Forest Service.

Lake House, Maymyo, Burma,
4 October 1926.



Note.

This map is a reduction of the compilation by Major Kenneth Mason, M.C., R.E., of the Survey of India, based on $\frac{1}{2}$ in. to 1 mile plane-table surveys, adjusted to fixed triangulation points, by Afraz Gul Khan, who accompanied the Visser Expedition of 1925. Areas in outline only have been mapped by previous explorers, except where shown in dotted lines, which are unexplored. Approximate contours are at 1,000 ft. vertical interval.

Scale 1/500,000.

5 0 Miles 5 10

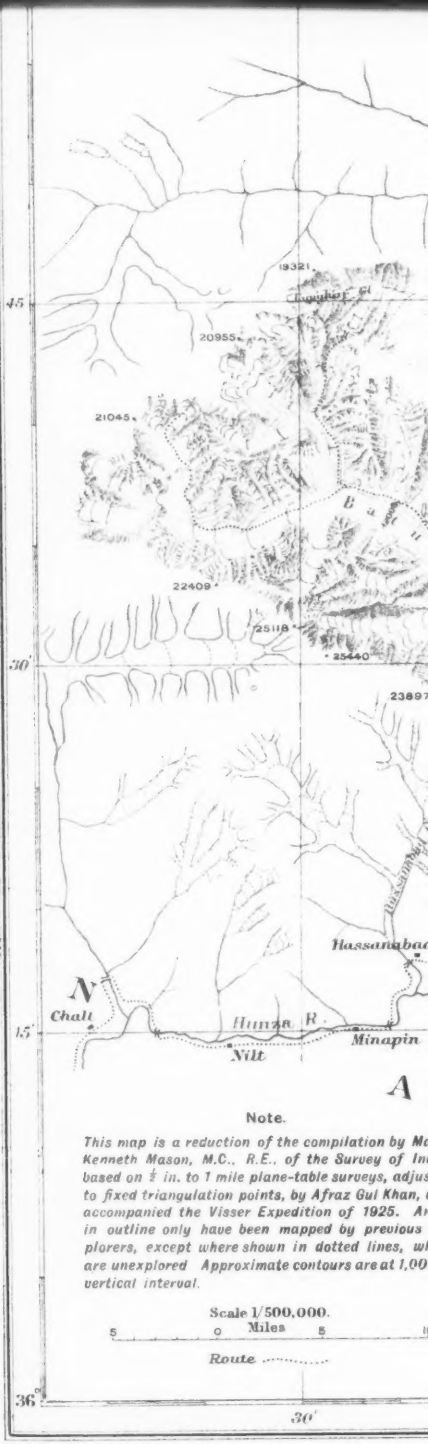
Route .....

Map to illustrate the paper on

XPLORATIONS IN THE KARAKORAM

By PH. C. VISSER

76°
45'
37'
Oprang P.
Shingshal P.
Nai Dur P.
20810
19670
11335
19633
20130
21680
21750
20160
19915
20460
21576
15'
30'
A
Z
N
G
A
R
A
ACIER
CASPIAN SEA
Aral Sea
Khiva
Bukhara
Samarkand
Tashkent
Kuldja
Turfan
Kashgar
Yarkand
Merv
Meshed
Herat
AFGHANISTAN
Kabul
Srinagar
Peshawar
Leh
Lahore
Kelat
BALUCHISTAN
Karachi
ARABIAN SEA
PERSIA
Kerman
Pamirs
Hindu Kush
Karakoram Range
Kuen Lun Range
Himalaya Mts
TIBET
NEPAL
INDIA
Calcutta
Ganges
Indus
Sutlej
Area of Map
Khotan
Scale 1/42,000,000
100 0 500 MILES
40°
60°
70°
80°
90°
40°
30°


19321
20955
21045
22409
25118
25440
23897
45'
30'
15'
36°
30'
Hassanabad
Chalt
Hunza R.
Minapin
Nilt
N
A
B
Note.
This map is a reduction of the compilation by Ma
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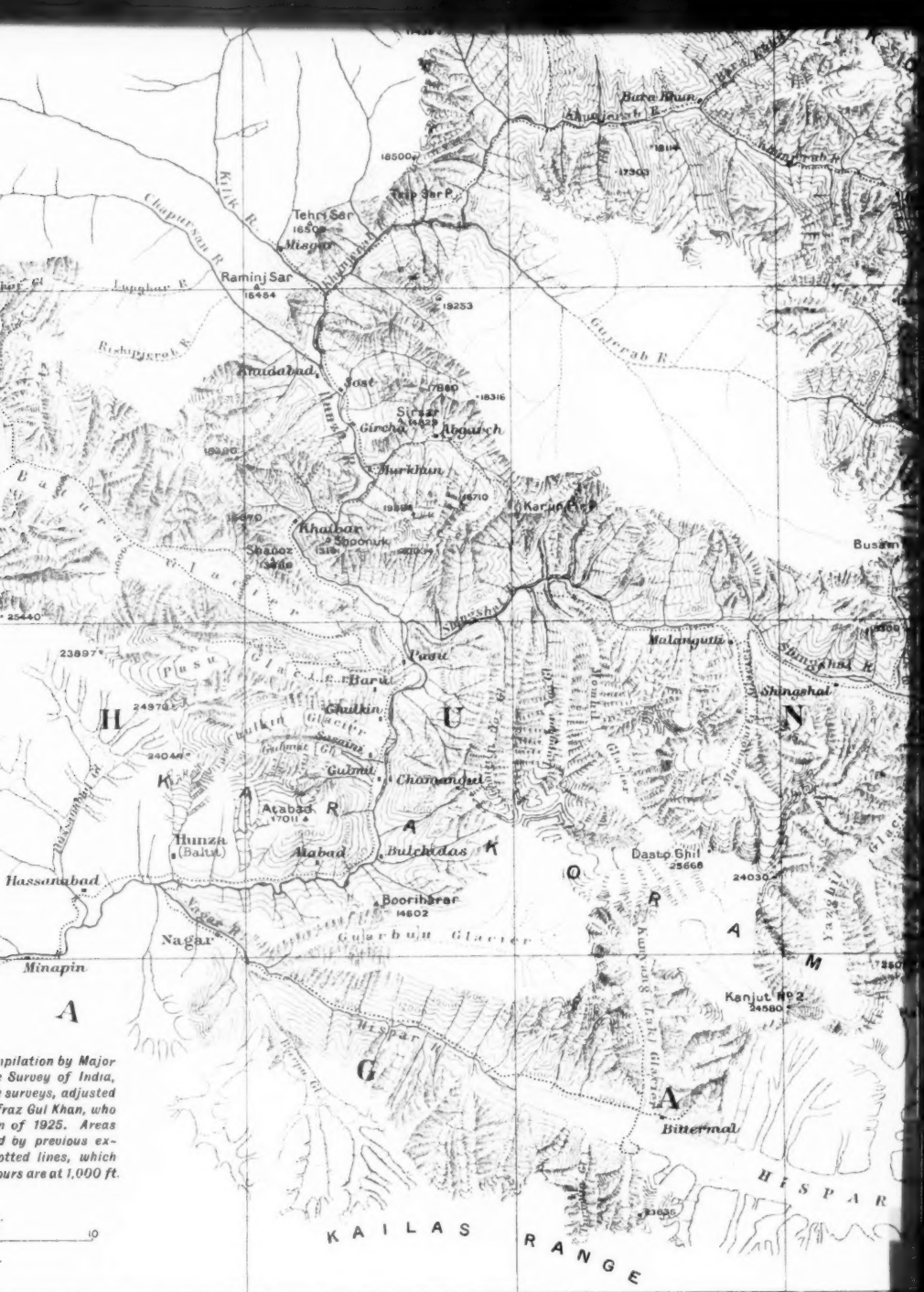

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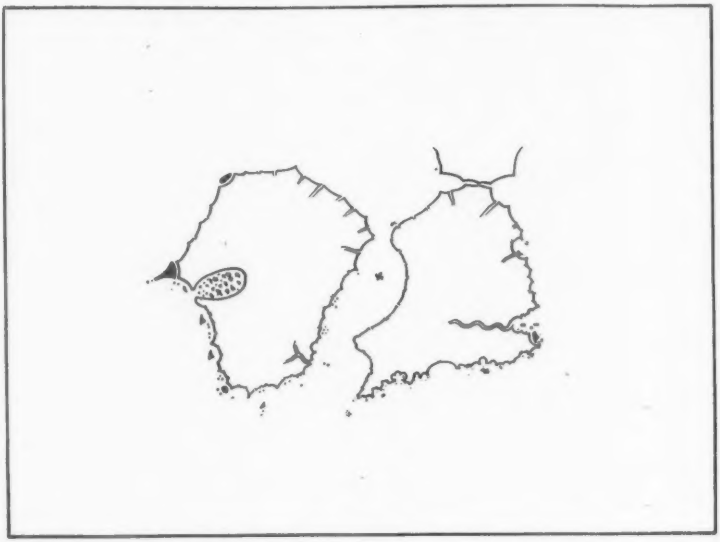
THE KARAKORAM
Visser



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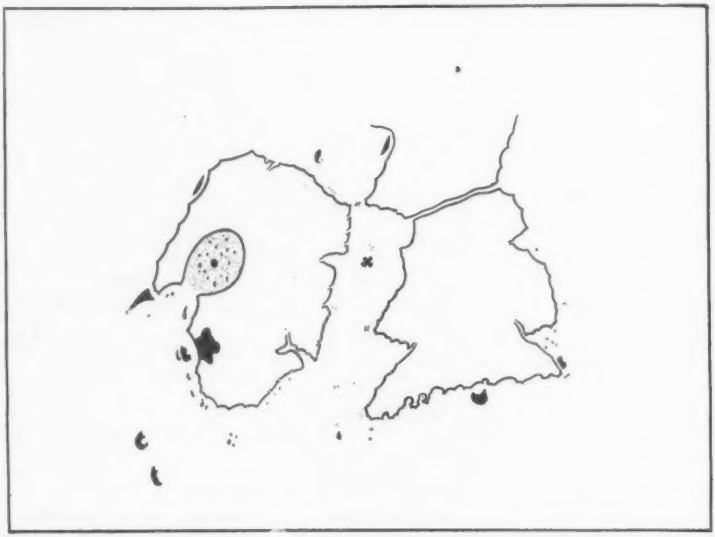

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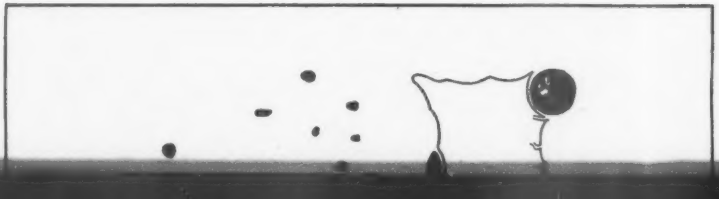

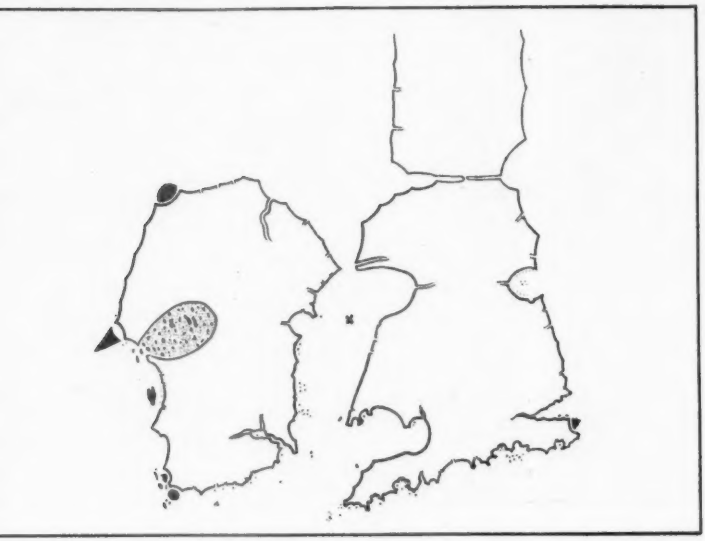

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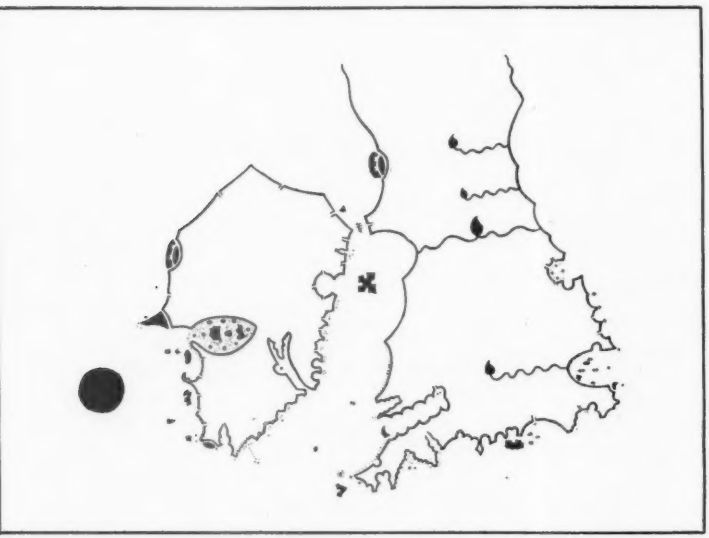

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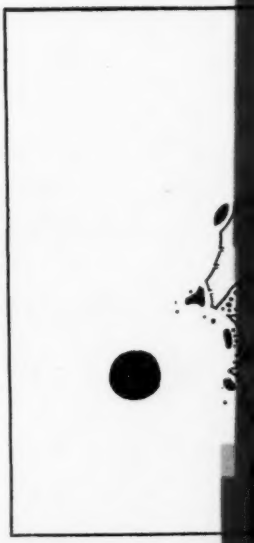

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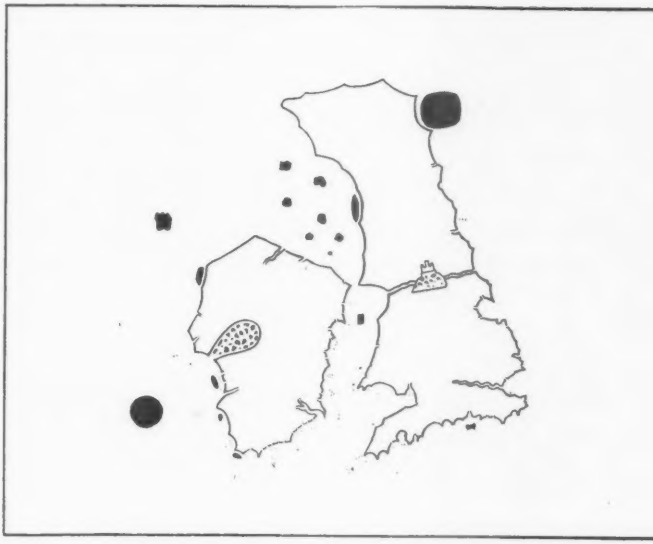

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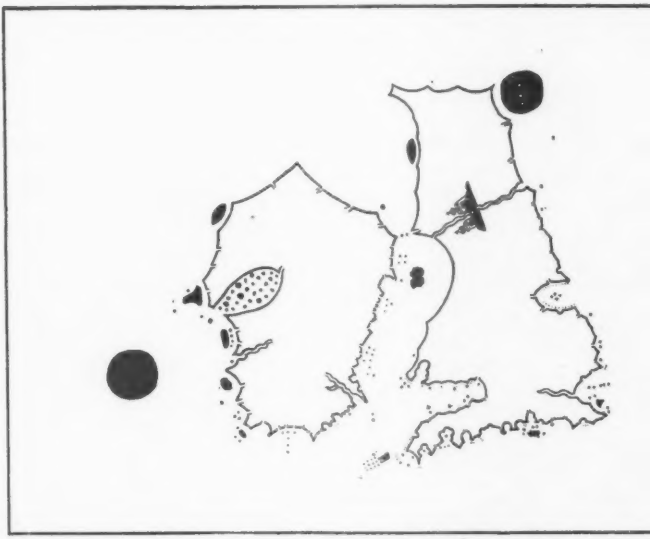

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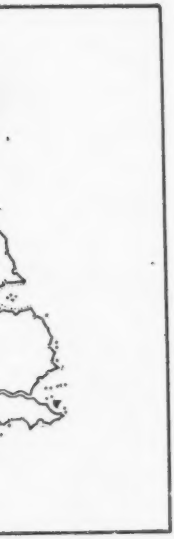

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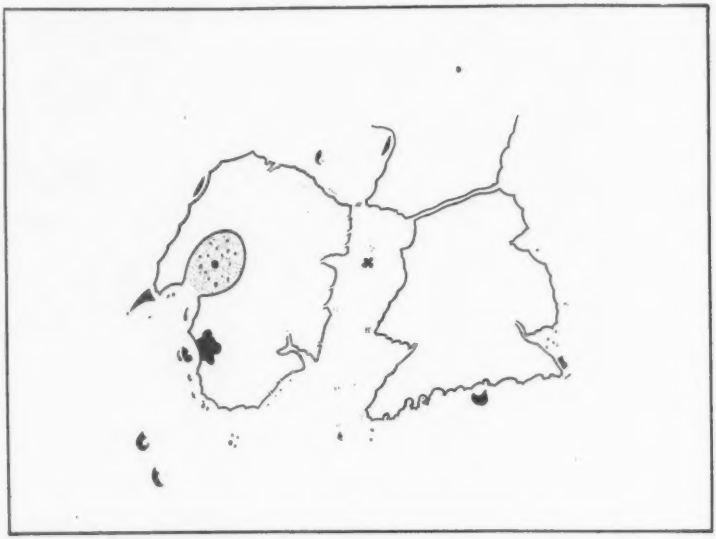

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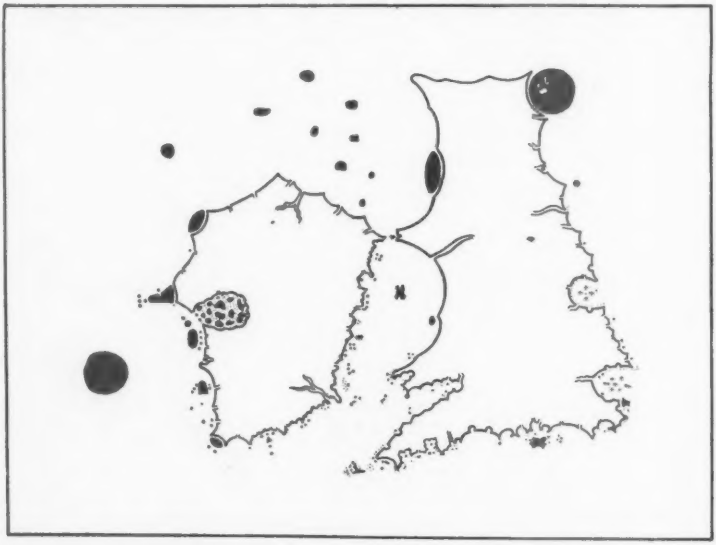

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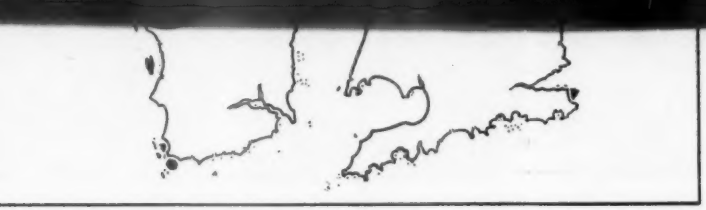

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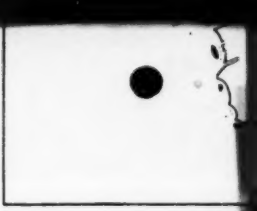

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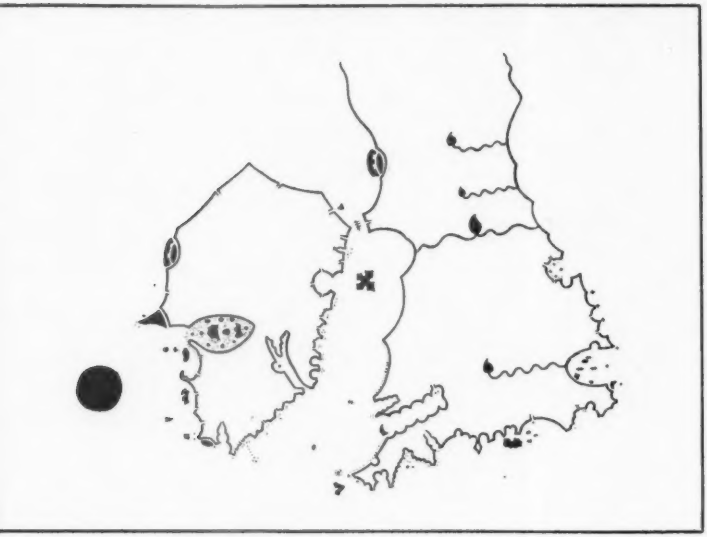

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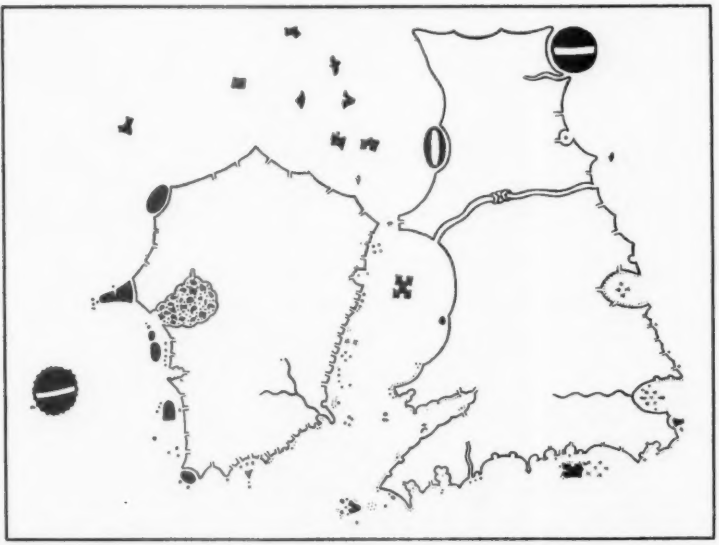

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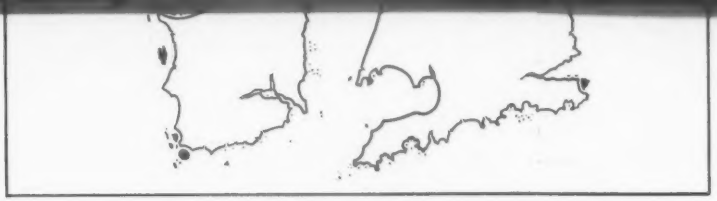

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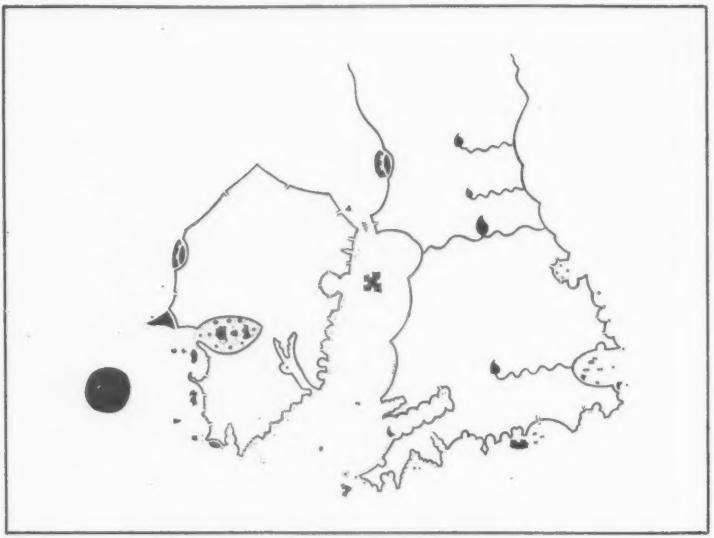

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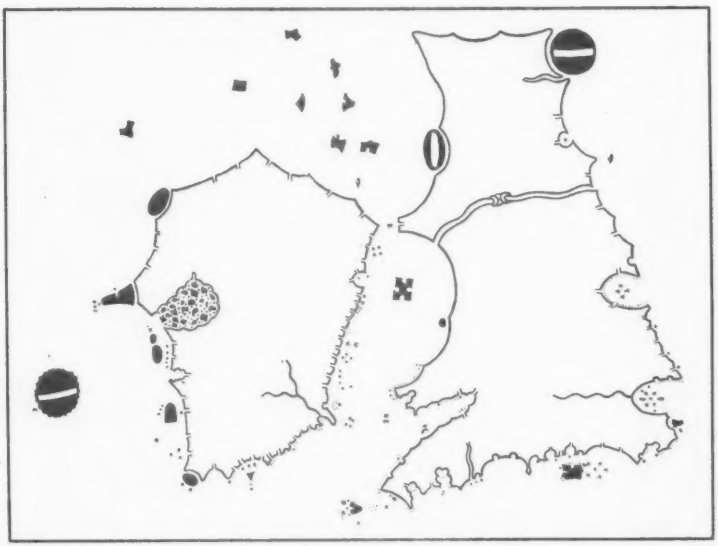

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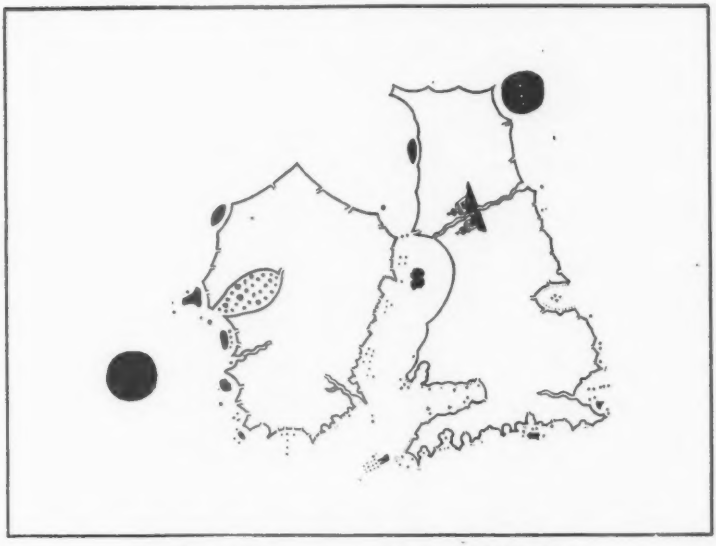

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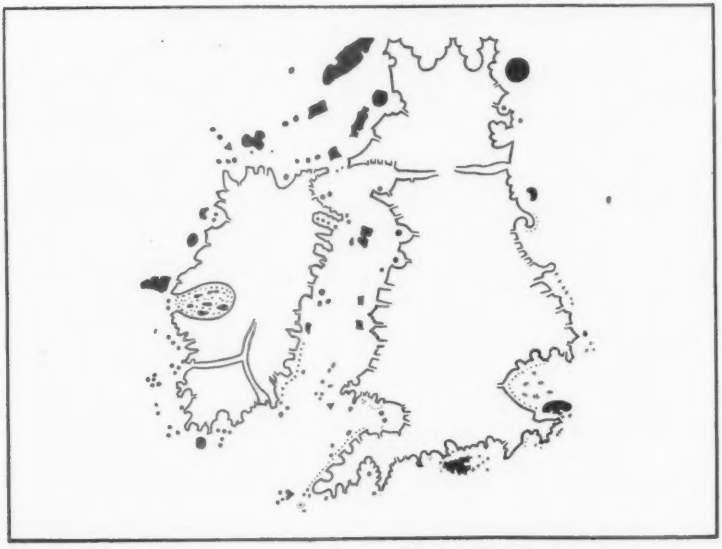

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OF
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